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The Farmer's Digest

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The Farmer's Digest

Volume 13 April, 1950 Number 12

Good Legume Stands

Condensed from Successful Farming

Dr. C. J. Willard
Ohio State University

A good legume crop makes you more money than anything else you grow. But lack of care in the seeding often robs you of a stand. Here is how to make sure you get a stand *every* year.

We're pretty careful about how we plant our corn. But most of us haven't greatly changed our method of sowing sod crops—the most vital part of our farming system—from the way it was done 2,000 years ago. Only with our sod crops is a poor or lost stand a yearly hazard, even to better farmers.

But the sod crops are the only truly soil-conserving crops we grow. And they are our cheapest, most important livestock feed. There are many reasons for failure; the man who gets a good, even stand of clover, alfalfa, bromegrass, or mixtures of them, must do many things right:

Make sure your soil is sweet. Many failures of forage seedings still come from soils so acid the seedlings can't survive. This is an old, old, story, but it seems to need retelling. There are still millions of acres that need lime for really good seedlings. Are yours, by any chance, among them?

Don't allow starvation to ruin your forage seeding. It often does. Put plenty of phosphate within an inch of the seed or directly under it. That's the most important single element for legumes in the Cornbelt. Along the Eastern seaboard, potash is often lacking. Phosphate especially encourages root development, and putting fertilizer with or under the seed has been profitable even on soils which show no response to fertilizers in any other way. How much more then, will phosphate pay on soils on which phosphorus is the element which limits crop production, as on a majority of acres in the Cornbelt?

Reprinted by permission from Successful Farming
Des Moines, Iowa, February 1950

Do a careful sowing job. Unfortunately, a few machines for sowing fertilizer with forage seeds have been well developed. The fertilizer attachment on the grain drill would be excellent, if there were also a sure way to prevent the forage seeds from being placed too deep.

Ideally, fertilizer should be placed deeper than the seed. For the present, the most practical plan is to broadcast as nearly as possible on top of the fertilizer band, but in most seedings this isn't very easy. When sowing in small grain, the fertilizer band is occupied by the grain. You can use every other shoe of the drill for grain, and the alternate openings for forage. This gives a band of fertilized forage, without competition, every 14 or 16 inches. But this is not as close as is usually desirable. These wide rows are good for forage seedings in dry climates or seasons. In favorable climates or seasons, they make little difference.

Don't let a "nurse" crop smother the seeding. Most meadow and pasture seedings are made in companion crops of oats, wheat, or barley. "Nurse" crops, they are often called. They have been called that so often, many people think they are a help to the forage seeding. But, for the most part, they are not. We sow in small grain because, if we are successful, we get a return from the land during the year of seeding. Furthermore, experience shows that if we don't sow small grain, we will get a "nurse crop" of weeds which will do more harm than the grain and be worth nothing. Grain matures in midsummer, leaving the field to the forages; few weeds do!

Decide which grain makes the best companion crop. Any spring grain is better for alfalfa than any winter grain. Red clover, which endures shading better than alfalfa, and drouth not as well, may do better in winter wheat. This matures early, and offers less summer competition for moisture than oats. Winter barley, with its dense, vigorous, early growth, is almost hopeless as a companion crop on fair to good land, unless it is pastured or clipped early. Spring barley, because of its short growth and early maturity, is more favorable than spring oats.

When we sow in winter wheat or other winter grain, a major hazard is that the grain is already there, and growing so fast that the forage often does not have a chance. To meet this, we should sow clover as early as possible, so that the grain is as small as possible when the forage starts. Then, however, we run a chance of having the seedlings killed by freezing, so we'll have to try for a happy medium.

Don't let frost ruin the seeding. Clover and other seedlings are

most easily killed by frost just as the root breaks through. At this stage a temperature of 26° will kill the seeds. Before the seed coat breaks, and after the seedling has true leaves, it is much less easily killed.

Here, the plants of wheat or other winter grain really protect the seedlings. There is a surprising difference in the temperature of soil under wheat and in the open —a difference which saves a lot of clover and alfalfa in March! There seems to be no difference between adapted alfalfa and clover in the ease with which they are killed by early freezes. In years of comparative tests, alfalfa has done best sown as early as clover.

Make a split seeding. As the most favorable date varies with the season, a good plan is to sow half the seed early, the other half two to three weeks later—perhaps drilling in this last seeding. This "split seeding" takes more labor, but is good insurance.

When is "early"? In general, it is when the frost is out of the ground, but the surface still freezes more or less at night. Along parallel 40 degrees—the latitude of the Kansas-Nebraska line; Springfield, Illinois; and Columbus, Ohio—"early" will be about March 10. The traditional "honeycombed ground" of this period does not develop on all soil types, but is an aid in covering seed where it does develop. More important, however, is the fact that the surface does not dry out at this season. So seeds can then germinate even on the surface, without being killed by drying.

Don't broadcast if you can drill. On any day you can get a drill in the field, clover or other forage drilled that day will give a better stand than seed broadcast that day. Even the smallest seeds need *some* cover.

Fertilizer can be sown with the seed when it is drilled, and it's a big help in getting a stand. But we can't always get in the field early with a drill, and clover broadcast early is often better than that drilled later. Too, by broadcasting early, the job is out of the way, so good weather can be used for other pressing jobs.

Use a mixture. It's one good insurance of having something for cow feed out of a seeding. Alfalfa starts best in a dry season. Red alsike, and Ladino clovers start best in a wet season. We do not know what the weather will be after seeding this spring, but if we sow both alfalfa and clover, we are more certain to have some legume present than if we sow either one alone.

There are also advantages to some grass mixtures. However, mixtures should be made up to fit definitely known needs, not be a "shotgun" mixture of everything in the seed catalog.

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dressing, if you can provide it. One of the best helps to a stand in winter grain is to top-dress it with 3 or 4 tons per acre of strawy manure any time before the forages are sown, but as early as you can. This mulch helps protect the seedlings against freezing, first, and against drying. It has often made the difference between good and poor stands. So important is this that, where winter wheat is used as a companion crop, a light top-dressing on the wheat with the strawiest manure available is worth more than putting the manure on land to go into corn.

Make sure the seeding isn't shaded out. Often, winter grain gets to "growing like a house afire" in April. Forage seedlings in it, alfalfa especially, are killed by lack of sunlight. The most practical remedy, if the crop is to be left for grain, is pasturing until just before the jointing stage. Sometimes, the grain may be harvested entirely by pasturing—always with benefit to the seeding.

We have yet to hear of a seeding damaged by pasturing, either winter or spring grain—but thousands of seedings have been killed by too much grain.

If you can't pasture, perhaps you can clip the rank wheat with a mowing machine. Mow at "full tiller," just before jointing, and take off half or more of the leaf growth present. If the unclipped wheat lodges, the clipped wheat may outyield the unclipped. If there is no lodging, clipping will usually cause a loss of 4 or 5 bushels per acre, but it often saves a legume stand.

So far, we have talked entirely about winter grain. Sowing in spring grain brings a whole new set of problems. A spring grain companion crop should be sown at least 2 pecks lighter than when it is sown just for grain. The advantage in this is not great, but it is important.

There is no such advantage in sowing winter grain at light rates. Unless the rate is excessively low or it is sown extremely late, winter grain will have time to stool out until it produces a normal number of heads from the rate sown. Thin stands of grain are less likely to lodge than thick stands, as well as giving less direct competition to the seedlings.

We sow spring grain and forages at the same time, so they grow together for a period without competing too much. The forages can better endure shading and drouth when it comes after they have some growth. That is the basic reason for the greater success of alfalfa and sweet clover in spring grains.

But in spring grain, we sow on newly prepared—and therefore loose—seedbeds. Forage seeds are small. They come up best from under only ¼ to ½ inch of soil. On loose seedbeds, they can hardly

be planted as shallow as that, except by broadcasting. Then loose soil quickly dries out deeper than ½ inch, so that shallow-planted seed does not start—or, worse, it starts, but the seedlings cannot establish.

In spring grain, or on any prepared seedbed, every precaution should be taken to avoid sowing forages too deep. The usual grass-seed attachment in the grain drill will waste half or more of the seed sown through it, because it broadcasts the seed in front of the grain discs. Then the discs cover much of it too deep.

Ohio Experiment Station workers tell of repeated failures of timothy on one of the experiment farms, where previously they had been getting good stands. They had bought a new drill with a grass-seed attachment, and the farm superintendent, naturally, had sown timothy from it when the wheat was sown. When they went back to broadcasting timothy after the wheat was sown, they had no more trouble.

You can broadcast after seeding, or get the same result by substituting long delivery tubes on the grass-seed attachment for the usual short ones and tying them back to deliver the seed behind the drill. If you arrange these tubes to put the seed directly over the fertilizer band, it is nearly ideal. Changing the delivery tubes on your grass-seed attachment will save a lot of high-priced seed. Many companies have such tubes for their drills. Or rubber tubing can be cut to fit.

Even the special grass-seed drills often put forage seeds in too deep. It requires an especially firm seedbed if they are not to do this.

It is common to roll the soil, after seeding, with a corrugated roller. This is valuable, but it is much more important to use a corrugated roller *before* seeding. An almost ideal seeding tool is a seed box mounted between two sections of corrugated rollers. In this way the soil is firmed before the seeding; the seed falls on firm ground and is covered at a uniform, shallow depth. Such seeders account for big savings of seed.

A firm seedbed under the seed is important in fighting another enemy of spring and summer seedings—crusts on the soil.

Seeds have an amazing power to break crusts if they have something to push against, but if the seedbed is loose and a dashing rain forms a crust on top, seeds below the crust may literally push themselves into the ground instead of breaking the crust. It is not practical to break crusts over forage seeds mechanically once they are formed, but mulches can do a lot to prevent their formation.

Mulches conserve moisture and prevent the formation of crusts.

Many a good seeding is destroyed by overpasturing in the fall. It's a good idea to pasture a new seeding down close once, but early—before September 1, on parallel 40 degrees. After that—for about the last six weeks before killing frost—no grazing of alfalfa and clover mixtures should be permitted. Straight sweet clover, however, is best grazed in October. The legumes must have a period of undisturbed growth to accumulate reserve foods in their roots, so they won't winterkill.

Combined straw should be taken off all new seedings of red clover and alfalfa, especially east of the Mississippi river. In Ohio, as a 3-year average, when combined wheat straw was left on a clover-alfalfa seeding, the yield the next year was just half what it was where the stubble was clipped and the straw removed.

After all, as with most farming operations, good seedings result from doing a lot of small things just right. Few farm operations pay better dividends than exact attention to all the necessary details of the meadow seeding.

Does A Plant See?

Reprinted from The Land

James R. Simmons

My morning glory vine started life in a shady spot at the corner of the building, and after lifting a small tendril several inches from the ground, began prospecting for suitable pathways to the sun. Sometimes, as if discouraged, it would lower the tendril to the ground, contemplating, no doubt, a life of humble accomplishment there, and a limited existence among the giant weeds.

At this interval I pushed into the ground one day a slender cutting from a privet, five feet long, at a distance twelve inches from the waving tendril of the morning glory. In a single night the tendril found it, and started its upward spiral, always to the right, according to the manner of vines in our northern hemisphere.

In two weeks time my vine had completed its upward march to the end of this five foot length of privet. There another crisis even greater than the first was suddenly encountered, and the vine began

Reprinted by permission from The Land
Bel Air, Maryland, Autumn 1949

once more to wave its tendril about, seeking the lost trail to the sun.

Again I furnished the needed opportunity, by nailing to the building another five foot privet branch, allowing the lower end to reach within twelve inches of the upper end of the first branch. Then followed a performance so fascinating as to interrupt for a time all interest in regular work, and to require that notes be taken, at least at one hour intervals, for proper recording of a nature picture.

First, the tendril extended itself in a horizontal line, due south by the compass, and in an hour's time had moved to a point nearly due east. During the next hour it swung from east to northeast, meantime developing at its growing end a small hook, resembling the loop in a lariat. Apparently the vine was now preparing to make a cast for the end of the privet stick twelve inches above. This would require another hour of slow motion.

As the bold upward thrust was completed, the tiny hook closed over its objective, and for a time held securely, while other plants round about drooped in the intense summer heat. Slowly, however, its grip began to weaken. The first bid for a successful cast ended at 4 P.M. in failure. The vine then rested for two whole hours.

The second and victorious throw occurred after sundown, and with slight variation was conducted in accordance with the original procedure,—a preliminary pointing of the tendril to the south,, a swing to the east, the formation of the hook, and finally the upward hurl, two hours in process of completion, landing the sensitive lariat over the privet branch at a point precisely one eighth of an inch beyond a slight bud-swelling, which served the timely purpose of securing the tendril's slender loop.

Our next observation was made the following morning. During the night a corkscrew turn to the right had been made around the support, and when at noon we gathered again to take notes, my morning glory had reached the sunlight, confident in its future, and prepared for the happy days of bloom.

All the Milk She Can Give

Condensed from The Breeder's Gazette

Elmer B. Powell

NINE out of every 10 of our dairy herds in the United States have perhaps half again as much milk and butter as is ever fed and managed out of them! The dairy cow is just a milk-making factory and she produces most profitably when she is running at full capacity.

Authorities at Purdue University selected from farms in Indiana 5 mature cows of known past production. These were brought to the experiment station and through better feeding milk production was upped by 3,598 lbs. per cow and butterfat by 114 lbs. *This extra output increased the income-above-feed-costs 74%!*

Many dairymen become confused by overstressing the importance of cost of grain feed. These stockmen are in the habit of thinking in terms of total feed cost—usually only about one-half of all expenses. Under normal conditions the concentrate portion of a dairy ration is not more than 28% of the total cost of milk production. As the concentrate allowance is decreased, more roughage is consumed, thus lowering body condition and milk production. Too many farmers are still trying to starve profit out of dairy cows.

The following table gives actual figures from pre-war Cow Testing Ass'n records and shows the importance of producing to capacity. Although these prices are pre-war, the comparison is still sound.

LOW COST VS. MORE PROFIT

Monthly Item	Herd "A"	Herd "B"
Feed cost per cow ...	$ 5.61*	$ 9.28
Return per $1 of feed	1.89*	1.60
Return above feed cost	32.60	66.41*
Net return per cow ($18.40 overhead deducted	14.20	48.00*

* Most favorable figure.

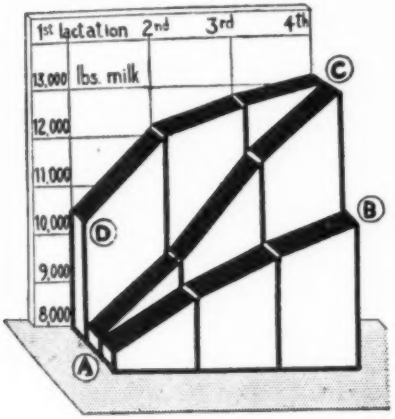
As demonstrated above, it is not feed costs per cow per month that is most important, and it is not return per dollar invested in feed. The item that determines the dairyman's standard of living is his *income over and above all costs of production.* If 30 cows were milking in each of these herds, the farmer whose feed cost was considerably higher would be realizing better than *$1,000 monthly more profit* than the herd where feed was "economized." So *keep cows performing to capacity.*

Early development of a heifer is highly advantageous, and a good

Reprinted by permission from The Breeder's Gazette,
Spencer, Indiana, January 1950

start is essential. The vigor, vitality and likelihood of survival of a dairy calf is largely determined *before* birth. And this depends to a great extent upon how the dam was fed, especially the last two months of gestation.

A heifer should be brought into production in regard to her body development and not according to age. The younger she is when maximum growth is made, the cheaper it is secured and the better the individual will be.



From a production of 8,383 lbs. milk as two-year-olds, the 12 grade dairy cows could be expected (calculated by correction factor) to yield at level indicated by Line AB. However, through good feeding & management these cows, originally 50 to 100 lbs. underweight, responded by actually following Line AC to give 4,518 lbs. extra milk in 4 lactations. 12 other heifers of same breeding and milking cacapity (as shown by equal production when mature) but which already had obtained their body growth by being rapidly developed and whose dams were well fed, pailed out 5,217 lbs. more than the underdeveloped heifers as shown by Line DC. Just look how they increased the milk check those first three critical years!

We learned years ago that the so-called age correction factor used in calculating mature milk production is in reality a body development correction factor. You can reduce by 1/10 the number of heifers required for herd replacement by growing out your heifers to *freshen three months earlier with equal body development.*

The same amount of feed required to put 100 lbs. of growth on a dairy heifer *after* she is two years old could produce 1500 lbs. of 4% milk, if fed to an animal that does not have to finish growing. This is too high a price for growth, when you can secure it much cheaper at an earlier age.

The reason a first-calf heifer does not produce as much milk as a mature cow is because she is not through growing, and as a result steals some of her milk ration to finish body development. Let's see what all this means in milk production.

At the Purina Research Farm we purchased 12 grade Holstein heifers just before freshening as two-year-olds. They produced an average of 8,383 lbs. milk during the first lactation. By applying the age correction factor, they could be expected to make 9,482 lbs. their second lactation, 10,329 lbs.

the third, and 11,018 lbs. the fourth. Line AB on the graph represents this expected production. But at the time of their first freshenings, these undeveloped grades were placed on an adequate feeding program. Instead of following line AB, their actual production followed line AC.

When purchased as coming-two-year-olds, they were some 50 to 100 lbs. underweight and were not in good condition. We considered them just average "mine run" heifers. You will notice on the chart that it took one year before they showed much response to improved feeding. This is because they had to build up their bodies internally and externally before showing a significant response in milk production.

Line DC represents the actual production of 12 other grade Holsteins of the same blood lines and with the same milk production capacity, as shown by the fact that as fully developed mature cows in the fourth lactation they milked at the same level as the previous group. However, these animals were out of dams which had been well fed, and as calves these twelve were rapidly developed and were well fed throughout the first four lactations.

We have increased production of a grade Holstein herd 15 times faster than the average in the United States over the past 20 years, even though we purchased no females since the herd was founded and have never paid more than $500 for a bull.

Thus, with his present breeding, the dairyman can produce according to line AB, as the average herd does, or he can neglect the calves and heifers and then by good feeding and management after they are two-year-olds bring them up to follow line AC, or he can with good feeding and management *throughout their lives,* follow line DC. Which one of these dairymen will stay in business when competition becomes keen?

The popular opinion is that we are approaching another time in the history of our nation when increased efficiency will be essential to survival. Mechanization in some cases has stepped up crop production five-fold. But livestock has not experienced a similar increase in efficiency. This is true primarily because too many farmers are still *trying to starve and neglect profits out of their animals and poultry.*

You may ask, "Then why don't more people adopt better feeding and management programs?" They don't primarily because the average person considers his losses inevitable, and due to bad luck, etc. Or he may not be aware of the seriousness of these losses because they are scattered through the year and don't occur all at once.

It is a fact that the average small farmer who maintains 15 dairy cows, 10 brood sows, 200 hens and starts 500 chicks annually, will lose a total of 2 calves and heifers, 60 pigs and hogs, 40 hens and 75 chicks and pullets—a total of over $1,200 yearly.

If the same farmer, through blackmail were forced to pay $100 a month "hush money," he would soon lose his mind. But the same man will continue to lose year after year that much and more by poor feeding and management and is apparently unconcerned or unaware of the drain on his wallet.

Vermiculite Concrete in Animal Shelters

Condensed from Agricultural Engineering

Harvey W. Steiff

Member of the American Society of Agricultural Engineering

One of the farmer's oldest problems has been the cold, wet floor in animal shelters. Many farmers have believed that this moisture is due to the capillary action of ground water, and a wide variety of floor constructions have attempted to solve the problem. Some have been improvements over older types, but most have fallen short of their goal.

Our approach has been that cold wet floors are caused most often, not by capillary action, although this may occasionally be the case, but by temperature differances between the floor and the air inside the building, causing water vapor contained in the air to condense.

The experience of a farmer at Cedar Rapids, Iowa, is a good example. For years this man, who operates more than 20 farms in that area, had been troubled with damp poultry house floors. They were made of ordinary sand concrete, a material with good thermal conductivity. When he built a new poultry house, he was determined to have a floor that would eliminate all possibility of capillary action, which he believed was causing the moisture. He placed a concrete footing 4 ft above the ground. Over this went a reinforced structural concrete floor slab, with a conventional frame house above. The following winter, this new floor was even wetter than the floors in his other buildings. Why? Because the temperature of the air under the floor was colder than the temperature of the

Reprinted by permission from Agricultural Engineering
St. Joseph, Michigan, December 1949

ground, thus keeping the temperature on the surface of the floor well below the dew point.

We believe that cold floors result mainly from excessive heat loss to the ground itself, rather than through the foundations. Ground temperatures in many areas are much lower than the air inside an insulated structure, and much lower than the body temperature of the animals occupying the building. It follows that except in areas of very extreme weather conditions, the ground does not act as a source of heat for the building, but will drain heat from the structure and from the bodies of the animals.

The logical solution of the problem lies in the use of a material that will retard heat loss to the ground and, laterally, through the foundation—a material that is also inexpensive, easily installed, and permanent. Vermiculite insulating concrete is such a material. The mix recommended for animal shelters, one part portland cement to six parts vermiculite concrete aggregate, has a K factor of 0.65 Btu, as compared with 12.0 Btu for ordinary sand concrete. It costs little more than ordinary concrete, is installed in much the same manner, and since it is an all-mineral material, it will not rot, disintegrate, or burn.

Seven years ago, the first test floors were installed under our direction in various types of animal shelters on operating farms. We have watched them closely, and have made periodical checks over this entire period. We have found that without exception these floors stay warm and dry in the coldest weather, and are standing up with complete satisfaction. Thousands of such floors have been installed since that time. Vermiculite insulating concrete floors have the ideal qualities of being permanent, sanitary, and fireproof—like sand concrete—and, in addition, furnish the important added values of warmth and dryness.

A number of farmers have inadvertently furnished interesting comparisons of vermiculite insulating concrete and sand-and-gravel concrete in service under identical conditions. Seven years ago, a vermiculite concrete floor slab was placed in a hog house near Lake Park, Iowa. The workmen ran out of vermiculite concrete aggregate with about 10 sq ft of area to finish, and sand concrete was used instead. This portion of the floor is always cold and damp, while the vermiculite concrete slab is warm and dry regardless of outside temperatures.

Four years ago, a Wisconsin farmer near Thiensville remodeled his dairy barn and placed a vermiculite concrete floor only under the stanchion platforms and center alley. Sand-and-gravel concrete was used for the feeding alleys.

Both types of concrete were placed over a gravel fill and a subfloor of clay tile. No matter what the outside temperature, the vermiculite concrete remains dry, while the feeding alleys sweat and become slippery even on damp summer days. The owner was so completely satisfied with vermiculite concrete that he placed it under the floor of his new maternity wing and in in a new bull barn.

Another farmer near Humboldt, Iowa, was convinced that the wet floors in his animal shelters were caused by capillary action of ground water. So, when he built a new poultry house, he tried to install a floor that would be impervious. First, he put down a gravel fill. On this he placed a vapor barrier and a 3-in slab of ordinary concrete. This was mopped with 30 gal of asphalt. Next came another concrete slab. Despite these precautions, the floor was just as wet as any he had on his farm. Then he learned about vermiculite insulating concrete, and several weeks later he placed 3 in of vermiculite concrete over the existing floor. During the coldest weather of the past three winters, with temperatures reaching to –20F and with the same operating conditions as in previous years, this floor has remained dry. The number of bedding changes has been cut in half—a point to be considered with straw selling at $1 a bale and none too plentiful.

The thermal capacity of the floor is an important factor in the comfort aspects of an animal shelter. We know that the temperatures of the structural materials will always be lower than the body temperatures of the animals occupying the buildings during winter. When the material in contact with the animal is a good conductor, there will be greater heat loss from the animal, causing a cold spot that will bring discomfort, possible illness, and lower productivity.

In February, 1947, we arranged for a field trip for members of the Barn Equipment Association, so they could see the performance of vermiculite insulating concrete floors under severe weather conditions. We had hoped for cold weather, and our hopes were answered with a record-breaking blizzard, temperatures of –19F and wind velocity of 70 mph. Despite blocked roads, we were able to visit a number of farms. In every building where vermiculite concrete had been used for floors or wall insulation, we found that building warm and dry. Even more important, the productivity and health of the animals had not been affected by the severe weather. Floors of other materials were either very wet or very frosty, and the productivity of the animals had declined sharply with the onset of cold weather.

Vermiculite insulating concrete

is finding many uses on the farm: for masonry wall insulation, both in cavity-type walls and in the cores of blocks, using a 1-to-16 mix; for milk cooling tanks, using a 1-to-3 mix, for roof decks for poultry, hog and milkhouses, for subslabs under radiant-heat floor construction in animal shelters, a trend that should be recognized.

In an experimental project carried on near Minneapolis in co-operation with Northern States Power Company, a milking parlor and adjoining milkhouse were built of vermiculite insulating concrete blocks. The compressive strength of the blocks indicates great possibilities in one-story buildings where light loads are carried by the walls. This masonry milk house has received the highest rating by the Twin City milk inspectors of any in the entire area.

Double-Duty Fans Pay Out in Four Days

When a heat wave swept over New England last summer, poultrymen took a beating. Egg production hit the skids, and thousands of hens died of heat exhaustion. Many flocks lost 3% to 4%.

But on Harry Bederian's farm in Norfolk County, Mass., not a bird died during the heat. Fans made the difference.

Bederian originally installed the fans to blow humid air out of the houses during the winter. But when the temperature soared, he reversed the fans and circulated air through the pens. They paid for themselves in four days.

Last winter Bederian's litter stayed bone dry, and his 1,600 Rhode Island Reds maintained 85% lay in fan-equipped pens.

Bederian lets the fans run all day in winter when there is little air movement outside, but turns them off when a breeze develops. He's learned to judge the need for fans by the ammonia fumes.

The fans are 16-inch models, driven by one-quarter h.p. motors. He uses two fans in each 30′ x 50′ pen which houses 400 layers. Fans are mounted on the south wall, in the upper part of windows, just under the plate.

For litter he uses limed, built-up shavings.

Blueprint for Hungry Nations

Reprinted from New York Times Magazine

George W. Gray

Rockefeller Foundation Staff
Author of "The Advancing Front of Science"

An event not reported in any newspaper, but a picturesque reflection of a movement that seems likely to have far-reaching consequences, occurred not long ago in the Mexican village of Juchitepec. The villagers gathered to welcome (with an arch of flowers) and to honor (with a feast of native dishes) a group of young American agricultural scientists. Working as one with Mexican *tecnicos*, they had, in five years of research, developed improved varieties of corn and wheat especially adapted to Mexican conditions.

Juchitepec has celebrated many fiestas in its history, but never one like this—a fiesta honoring *Norteamericanos*. But then, never before had the village granaries been so filled with precious maize. Never before had its children been so well fed. This year there was corn enough, not only for the tortillas, but for feeding the chickens and a few pigs. This year there would be meat as well as bread.

Juchitepec is only a tiny part of Mexico, and Mexico is only a small segment of the globe, but the agricultural research project which this gay fiesta celebrated may well prove to be historic. Years hence, economists may look back on it as the beginning of a new kind of attack on the problem of supplying the world with food.

The project had its origin in a conference between the Mexican Secretary of Agriculture and officers of The Rockefeller Foundation. It had been suggested that scientific research be undertaken on a cooperative basis to see if it could increase the productivity of Mexico's food crops. The foundation agreed to provide a staff of agricultural scientists and to help build, equip and operate the necessary laboratories. The Mexican government, on its part, agreed to set aside land and facilities for the experiments and to assign young Mexican men and women to serve as research assistants and associates, thus creating a group of native scientists who, it is expected, will eventually take over direction of the work.

Reprinted by permission from New York Times Magazine
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The joint effort has been in operation since 1943 and truly remarkable results have been achieved. The most dramatic is the development of improved strains of corn, wheat, and beans, some of which are producing from 20 to 100 per cent larger yields than the old native varieties. Today, in numerous experimental plots scattered over Mexico, two ears of corn are ripening where only one ear grew before.

When the idea was broached in 1941, it was evident that a survey of Mexico's agricultural resources would be necessary. The Rockefeller Foundation had long been engaged in public health work there, but it had had no experience in agricultural research. Accordingly it called upon three distinguished experts—Drs. Richard Bradfield of Cornell University, Paul C. Mangelsdorf of Harvard, and E. C. Stakman of the University of Minnesota—to serve as a survey commission. The three Americans spent two months in Mexico, traveling some 5,000 miles by automobile, airplane, and in the saddle. They visited sixteen of the thirty-three Mexican states; observed the characteristic soils, climates, crops, and other conditions; pored over the statistics of crop yields; inspected the current methods of farm cultivation—and came back to write a memorable report.

The report pointed out that despite the fame of its oil wells and and the fabulous stories of its gold and silver mines, Mexico was predominantly agricultural. More than three-fourths of the population had its hands in the soil. And yet, much of Mexican agriculture was operating at a miserably low level. More than half the farm land was planted to corn, but Mexico still had to import corn to meet its own necessities. The average farmer's yield was less than ten bushels per acre, compared with an average of twenty-five at that time for the United States. International statistics showed that in wheat production per acre Mexico ranked fifty-ninth among the countries of the world. In beans and other food crops production was similarly meager. "While Mexico is not blessed with a great surplus of productive land," concluded the commission, "there seems to be every reason to believe that her land resources are adequate, if well-managed, to supply all the needs of her people at a standard of living much higher that at present and at the same time provide a surplus of several tropical crops for export."

What to do, then, to help Mexico pull herself out of the agricultural doldrums? Dr. Bradfield, Mangelsdorf and Stakman agreed that it called for something different from the foundation's normal procedure of making grants to support research in

existing institutions. They felt that the situation required a group of experienced agricultural specialists in full-time Mexican residence "to cooperate with and advise the Mexican Department of Agriculture in its various activities, including experimentation and research, regulatory work, resident teaching at its various levels and adult education."

The Mexican Department of Agriculture welcomed this venture with keen enthusiasm and Director Warren Weaver of the Natural Sciences division of the foundation began to look for a scientist to head it up. He found his man in J. George Harrar, plant pathologist at Washington State College and head of the Department of Plant Pathology at the near-by Washington Agricultural Experiment Station. Dr. Harrar had formerly taught at the University of Puerto Rico, and spoke and wrote Spanish fluently. He was designated director of the *Oficina de Estudios Especiales* which the Mexican Department of Agriculture set up to embody the new project, and was assigned office space in its ancient, fortress-like building in Mexico City. For several months in 1943, Dr. Harrar, as sole scientific member of the *Oficina,* perspired his way over thousands of miles of rugged terrain, from the lush tropics of Vera Cruz to the arid plateaus and mountainous peaks of the north. Frequently he was accompanied by Mexican colleagues from other bureaus of the department. On these travels he began to collect seeds for later appraisal.

About twenty-five miles east of Mexico City, at the old hacienda of Chapingo, is the Mexican National College of Agriculture. The faculty extended a warm welcome to the new research bureau and sixty acres of college lands were placed at Dr. Harrar's disposal. The plantings made there were the beginnings of studies which brought hybridization to its present high stage of achievement. But between those early experiments and the attainment of the improved disease-resistant, high-yielding crops which thousands of Mexican farmers are growing today, lies a whole epoch of pioneering research in which many devoted workers shared.

Corn was tackled first. This Indian maize has been cultivated here for thousands of years. It is the Mexican staff of life. From it is made the tortilla, the ancient pancake of the Aztecs, the universal dish of Indian and *mestizo.* It is both food and utensil, for rolled into a scoop as "Montezuma's spoon" it serves to convey soup chile and other foods to the mouth. Tortillas are eaten at breakfast, lunch, dinner and supper, and someone has estimated that the well-fed Mexican laborer consumes an average of 40 a day.

More than 1,500 varieties of corn were collected by Dr. Harrar and his associates from Mexican fields. They were found in a wide range of climates. Some grew in isolated, protected valleys, others clung to dry hillsides; a few were found in the rarefied air of mountain steeps. The more numerous were stocks gathered from the great central plateau known as the Valley of Mexico and from the luxurious tropics. Brought to the *Oficina's* headquarters, the ears were shelled, the seeds packaged and labeled according to the places of origin. Then specimens of each variety were planted in experimental plots in different regions to see how they would fare. Farmers all over Mexico voluntarily gave the use of a few acres for these plantings. Today there are 300 sites at which such tests are under way.

The tests showed that only sixteen of the 1,500 varieties were definitely superior. They differed in time required to mature, in size and shape of grain, in adaptation to different altitudes and latitudes. Some gave a good yield in one region and were poor in another, but each had qualities which recommended it. The sixteen varieties were then sown for seed increase, and following extensive yield tests, six were offered to Mexican farmers for planting. One of these chosen varieties, tested for three years in the Valley of Mexico, yielded 25 per cent more crop than the best hitherto grown in that area.

But the plant breeders are not satisfied with merely seeking out the best native species. They know that by controlled crossing of two or more varieties it is possible to produce hybrids which are better yielders than any strains found in nature. And so, while the more promising of the natural varieties are being released, to give farmers the benefit of their increased yields, the bureau's geneticists have been crossing natural stocks.

In the fields of Chapingo—where 250 acres of the college grounds are now occupied by these plantings—one sees row after row of hybridization experiments. As soon as the ear begins to form on a stalk it is covered with a paper bag. Similar bags are tied over the tassels to catch and hold their pollen. After a few days have passed the tassel bags are removed and the pollen they contain is applied to the ear shoots of the plants selected for cross-fertilization. By these means, crosses have been made between the sixteen superior native varieties and their progeny, and between these and other varieties, some imported from other lands. In this way several excellent hybrids have been developed, some with yields 50 to 100 per cent better than the best of the native varieties.

But hybrid corn, the kind which has revolutionized the agriculture of our own Corn Belt, requires slow and costly procedures. In order to obtain seed quickly in the quantities required and at reasonable cost, the *Oficina* resorted to the corn-breeders' short-cut known as "synthetic varieties." In this technique a number of the better strains of two varieties are planted in the open field in alternate rows. Then all the rows of one variety are detasseled and left to be pollinated by the other variety through the action of the wind. Some of the resulting ears may be better than others.

But in the course of two or three years of successive breeding these variations will level off and the corn will reach equilibrium. The synthetic does not give as high a yield as a double-cross hybrid—it may give only a 20 per cent increase—but improving one of the sixteen already superior native varieties by a factor of 20 per cent is something worth doing.

Through five years of corn-breeding experiments eight acceptable synthetic varieties have been obtained. Last year, enough seed was produced to plant about 500,000 acres. From the seed saved from last year's crop, some 750,000 to 1,000,000 acres were planted in 1949, or nearly one-tenth of Mexico's entire corn acreage. At this rate of acceleration, with the distribution of seed wisely controlled by the Government, and with the continuing cooperation of the farmers, it should not be long before the improved varieties completely supplant the inferior native stocks.

Distribution of seed is administered by a Federal agency, the National Corn Commission, which was appointed by President Alemán in 1947. This Corn Commission of three members has custody of all seed produced under the corn program. Seed of the improved varieties is given to farmers in exchange for their old seed. There is a follow-up system to instruct them in improved methods of cultivation, pest-riddance, irrgation techniques, and other measures of scientific agriculture. Last year the commission staged a contest to see which farmer could show the greatest increase in yield per acre. The prize, a Ford tractor awarded by President Alemán, was won by Pedro Barto of the village of Texcoco. On his small form, Señor Barto planted the Rockefeller-Mexican variety known as Rocamex V-7, and harvested 125 bushels per acre. His best previous crop had yielded forty-five bushels an acre.

Wheat was the second crop tackled by the researchers. The problem was to find or develop varieties which would resist the rust and other fungous diseases. Rust flourishes in a moist atmosphere. The two principal wheat-

growing areas are Sonora, the northwestern state which borders on Arizona and fronts on the Gulf of California, and the great inland plateau known as the *Bajio* which embraces several states north of Mexico City. Sonora is the richer, but it has a long coastline, and when winter fogs blow in to blanket the fields with weeks of humidity, growing wheat becomes an easy prey to rust. This happens about one year in four.

Today, thanks to the scientific labors of the *Oficina,* Mexico has eight varieties of wheat which are highly resistant to rust. In 1948, for the first time, Mexican farmers saw high-yielding, high-quality wheat growing normally during the rainy season. Last winter, there was a heavy rust epidemic in Southern Sonora, with losses so complete that farmers burned their crops to rid the fields of the useless, infected stalks. But those who had ventured to try the new Rocamex rust-resistant varieties were mostly immune to such disaster. One enterprising farmer in Sonora obtained from forty-five to fifty bushels per acre from the new seed, whereas in favorable years his yield from the native variety averaged only twenty-five to thirty.

A wheat committee appointed by Secretary Nazario S. Ortiz Garza of the Department of Agriculture is in charge of a program for the increase and distribution of seed of the new wheat varieties. From the 1,000 acres which were sown in the summer of 1948, enough seed was obtained to plant 15,000 acres last winter.

What has been done in wheat and corn is an index to what is being attempted in other crops. And the plant breeders or geneticists are only part of the team. In addition, there are plant pathologists, entomologists, soil chemists, microbiologists, and ecologists, each of whom is contributing his bit toward increasing the yield of Mexico's food crops. In the final analysis, yield depends on how well the plant is able to withstand untoward conditions. The program of the *Oficina* is, therefore, concerned with fortifying the plant's natural resistance to diseases, to insect depredations and to drought; and its studies are also directed at increasing the fertility of the soil, saving areas from erosion and improving the methods of cultivation.

Headquarters of the *Oficina* remain in the Department of Agriculture building in Mexico City, but its principal laboratory facilities are on the grounds of the National College of Agriculture at Chapingo. Here a convenient and commodious building has been erected with Rockefeller and Government funds. It is set in the midst of the fields where the new varieties are in process of development and it is only a step from the

test tube and the microscope slide within to the waving rows of hybrid grains without.

The staff consists of eleven American scientists, fifty-six Mexican associates, and five Mexican technicians, in addition to administrative workers. Usually, there are a few visiting scientists and students. At present, the visitors number two from the United States and twelve from Central and South America.

The program aims to do more than improve the stock of plants on which Mexico depends for its food crops. A more fundamental objective is to improve the stock of agricultural scientists, so that the work begun in this cooperative project may be carried on as a permanent Mexican program. The Rockefeller Foundation is providing fellowships to enable promising Mexican students to pursue advanced courses in the United States.

Four such students are now studying on fellowships in this country—at Mississippi State College of Agriculture, Ohio State University, the University of Minnesota, and the University of California. Eighteen earlier appointees have completed their fellowships and returned to posts in Mexico, three of them to become faculty members of the National College of Agriculture.

An important practical question is the cost of such a project. To date, the Rockefeller Foundation has put $1,301,825 into it, including $321,555 for the current year. The figures for the Mexican Government are not known to the writer, but in 1949, in addition to providing many hundreds of acres of land for the experiments and paying the salaries of Mexican scientists and others whom it assigned to duty there, the Mexican Department of Agriculture invested 430,000 pesos in the *Oficina*. In relation to the results accomplished, the money expenditures, both Mexican and American, have been trifling. Compared to the cost of direct subsidy, the expense has been infinitesimal.

Perhaps the deepest significance of the Mexican agricultural program lies not in what is has accomplished in Mexico, but in what it may augur for other agriculturally undeveloped areas of the world. The United States has succeeded, perhaps more than any other nation, in applying science to the improvement of its agriculture. Instead of giving away to hungry countries the surpluses resulting from our own efficient agriculture,—a procedure which is only palliative at best, and which in fact means giving away part of our soil fertility—would it not be more sensible to export our agricultural "know-how," and thereby help our neighbors to help themselves? The Rockefeller-Mexico agricultural program has

demonstrated that a mere handful of well-trained scientists, freed of the strangling restrictions of governmental red tape, can, in an amazingly short time, catalyze the agricultural economy of a nation.

Sheep Raising Tips

Condensed from The Farm Journal

Paul Friggens

A BUSINESS as old as the Bible is making some important changes. From Texas and Arizona to Montana and Wyoming, the range sheep industry is beginning to streamline itself. What is still a sick and ailing business, wracked by high costs, is building a foundation for a strong comeback.

Progressive sheep men are slashing high labor costs; they're growing heavier lambs and heavier fleeces with longer wool; they're carrying more sheep per acre of range, without over-grazing; and they're getting more lambs from the same number of ewes.

How are they doing it? For one thing, the sheep herder is being replaced by fences—in fact, in the Southwest, the sheep herder is the vanishing American!

It costs up to $600 per mile to fence in rough country, but these southwestern sheep men are convinced that it pays off. They point out that fencing cuts costs from $3 to $4 per sheep per year . . . you can run from one-fourth to a third more sheep at less expense . . . you boost your carrying capacity, and the sheep get more feed from the same amount of range . . . death loss is only 5% to 6%, while it runs as high as 12% under the herder system . . . the sheep graze on dizzy slopes and crags (where a herder would never think to go) and bed on high rocky spots where their manure starts a grass covering . . . there are fewer trails to start gullies, and the sheep don't bunch up and tramp out the range . . . the ewes raise heavier lambs, and cleaner and more uniform wool . . . and fencing encourages double use of the range—cattle graze the meadows and lowlands; the sheep take over the rough uplands.

These western sheep men are also putting more wool on their sheep. This promises to add millions of dollars to their incomes. New Mexico producers are doing

Reprinted by permission from The Farm Journal
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it by classifying their sheep for length of wool. They're breeding up from what they've already got, without expensive replacements.

"A" wools are 2½ inches or over; "B" 2 to 2½; "C" under 2. Anything over 3½ is "Super"—and this is the real breeding stock to use in improving the herd. The sheep are marked according to their classification, and split into separate breeding pastures.

After classifying, the sheep men put their best rams on their best ewes, gradually working up to the point where they're raising enough "A" or "Super" rams for even their poorest ewes.

Another new twist is ram certification, which means this:

Suppose you're selling rams. A State College livestock specialist will look them over for length of wool, open face, and wrinkles. He'll weigh them and estimate the clean wool. Then he'll clip a lock from the right hip.

At sale time he'll clip the same area again, measure the wool, and predict how much fleece the ram will grow in 12 months. If the ram's got what it takes, he's certified.

Ranchers are buying these rams, rather than paying fancy prices for imported rams that don't do as well. They pay less for a neighbor's "Super," and get a better sheep. The cost of breeding a ewe this way has dropped from 70 cents to 25, with a bigger lamb crop to boot.

And when you buy a ram in New Mexico today, you don't buy a ram in a poke. The rams are sheared right in the sales ring, the fleeces are weighed—and the rams, too. As a result, breeders are bringing better sheep to each sale. Stud rams have come up two pounds in clean wool, and a half inch in staple length.

Classifying, certifying, fencing, and the sales of "stripped" rams have boosted New Mexico's average fleece weight three pounds in the grease, and put an average of 10 pounds on its lambs, within a few years.

If you cull the ewes that don't lamb their *first year,* you'll increase lamb production. At the U. S. Sheep Experiment Station at Dubois, Idaho, ewes which had a lamb their first year, even though they may *not* have raised it, averaged 14 pounds more of lamb each of the next three years than the ewes which did not lamb the first year.

Ewes *raising* their first lamb averaged 16 more pounds of lamb each of the next three years. Ewes with twins, regardless of whether they raised them or not, averaged 19 more pounds of lamb the following three years!

Sheep raisers are learning how to sell, too. A few years ago wool buyers used to come to town, and wait for the sheep men to jog in 100 to 200 miles over bad roads.

Then the buyers *told* him what they'd give for the wool. Not today. A big percentage of Southwest wool is graded as to staple length, warehoused, and sold as uniform clip.

Better range management is also cutting costs and increasing output. New range is being developed by burning sage and removing brush. Reseeded pastures are springing up here and there. Pastures are being rotated. The sheep are getting more to eat from the same area.

Here in summary is a hatful of tried and tested tips gathered from the top-notch sheep men from one end of the range country to the other. Some of these ideas will work anywhere.

Breed for a good fleece—with length and density—and a heavy lamb. Good operators get from 50% to 60% more wool and lamb from the same feed.

Sheep with long-staple wool are early breeders, better "doers," especially the fine wools. Early breeders have more vigor, produce more lambs with better conformation.

Here's a rule: each additional five pounds of yearling ewe weight in the fall means 10% more lambs —and they'll weigh five pounds more the next fall.

Pick a ewe with stretch, a good leg, open face. It costs 20 cents per year to shear the ewes. In the West, open faces do better, weigh more, turn out more and bigger lambs, shear more pounds of wool per head. Short-fleeced, wrinkled ewes produce 20% fewer lambs and less wool, which is also lighter.

Pick your rams by scale weight and be cold-blooded about it. If possible buy rams with certified wool growth. Select a ram that's suited to your climatic and feed conditions, and stick to that type and that breed.

Give young rams a chance to grow out. Don't stunt them as yearlings. Keep both rams and ewes in good condition before breeding. It's a good plan to rotate your bucks, say every 12 days, one fourth in, one fourth out.

Shear before lambing to prevent heavy ewes getting down, losing wool in brush. Shorn ewes seek more shelter, take better care of lambs.

If you're fenced, leave ewes alone at lambing time.

Lamb early (depending on climate). Early lambs are stronger, heavier, shear about a pound more wool.

Keep ewes in good condition before and through lambing.

Provide plenty of water. If herding, corral the drop band on clean ground each night. First 24 hours is the most dangerous time in a lamb's life.

Keep ewes and lambs for 10 to 15 days in a series of "traps" of small pastures, then double up and move to open range. Small

bunches do better.

Mark, dock, and castrate anywhere within three days to two weeks. Delay means greater loss of blood. Vaccinate for sore mouth if necessary. Gather in small bunches for these operations, using portable wire corral. Many sheep men truck lambs to these corrals.

If you're fencing, use a 35-inch woven wire with good treated posts ten steps apart. String three barbed wires above. Provide water gaps in draws, gulches, canyons. Fence on high ridges wherever possible in rough country.

Use lighter cross fences and plenty of them—they're cheaper.

If herding, change bed grounds every three to five days the year around.

Equip your ranch with efficient, labor-saving corrals. Round ones work best. Keep corrals clean.

Study your range, topography, type of feed, and rainfall, to work out best carrying capacity. *Moderate* grazing is better than heavy or light, reseeds range automatically.

Plan water development and reseeding for your type of range.

Lick ticks, flies, with DDT, benzene hexachloride. Use phenothiazine-salt for worms. Kill predators with thalium, 1080, cyanide gas, strychnine, traps.

Use salesmanship with your sheep.

Remember that fleece income *per ewe* is more important than grease price per pound of wool.

Present a uniform package to the wool buyer, graded for quality and length.

Sack separately tags, stained and black wool, crutchings. Tie each fleece with paper twine. Work on a roll-top table with ¼ to ½ inch space between rollers—the tags and dirt fall through and leave cleaner, better wool.

Government and private agencies will core-sample your wool for you. Try it to take the guesswork out of selling wool. Try trucking lambs to market instead of trailing. It saves shrink.

Only way to find the leaks is through accurate records.

Keep a ram book, and record every ram on the ranch.

Weigh each ram and his fleece each year. Take a wool sample, measure length of staple. Get rid of those with poor fleeces.

Try to cull ewes at a younger age. Faster turnover means faster herd improvement.

Stick to a practical motto:

"If One Sheep Can Be a Top-Notcher, They All Can!"

Should Range Heifers Be Bred as Yearlings?

Condensed from Utah Farm & Home Science

J. A. Bennett, L. A. Stoddart, L. E. Harris
Utah Agricultural Experiment Station

BREEDING range beef heifers to calve at two years of age is common practice on many Utah ranches, but some livestock men do not breed them to calve before they are three years of age. The latter individuals believe that early calving stunts the cow, frequently results in the cow failing to calve regularly, and reduces her total lifetime returns.

In order to obtain information on this problem, the Utah Agricultural Experiment Station started a test in 1944 in Cache Valley. Typical yearling range heifers were obtained from cooperators and carried on test until the fall of 1948. Part of these heifers were placed with bulls as yearlings and the balance first as two-year-olds. All heifers were grazed on typical mountain range during the summer and wintered in the valley on hay and pasture under usual conditions for northern Utah.

Only 63 percent of the yearling heifers that were in the pasture with the bulls became pregnant. Calving difficulties were common and several calves died at birth or shortly after. The first fall, 42 percent of the heifers from this early-bred group weaned calves. In most cases, it was the larger heifers that became pregnant and reared calves. Generally these were the older heifers that were early-spring calves rather than late-spring calves. It is not known whether the other heifers failed to breed or if they bred but failed to settle.

Calving as two-year-olds did not reduce the calf crop the next season, nor did it seem to have a bad effect in subsequent years. At the end of the fourth calving season these early-bred cows had produced an average of 3.71 calves, or the equivalent of approximately 93 percent average calf crop per cow per year. The group that calved first as three-year-olds had at the same age completed three calving seasons with an average of 2.6 calves per cow, or approximately 89 percent calf crop per cow per year. Part of this advantage in favor of the early calving group may be the result of the individuals in this group possessing an inherent make-up for a higher level of fertility and partly the result of the

Reprinted from Utah Farm & Home Science, Logan, Utah

influence of calving first at a younger age.

The early calving group had, in the fall when both groups were six years old, weaned an average of 1,236 pounds of calf per cow compared to 865 pounds of calf per cow for the group that calved first at three years of age. This difference of 371 pounds in favor of early breeding resulted from the cows raising an average of 1.03 more calves per cow and also from the calves averaging 10 pounds more in weight. This heavier weaning weight is difficult to explain since the two groups of cows were of the same quality. Perhaps, by chance, the early-bred group were somewhat heavier milkers, or perhaps these cows because of calving earlier in life settled more promptly and calved slightly earlier each season, as a group.

Early breeding did not, apparently, stunt the cows. The average mature weight of the cows that raised their first calf at two years was only eight pounds less than the average for the cows that first calved when three years of age. These cows were all reasonably well cared for during the winter season. In most cases the cows at least maintained their weight or gained slightly during the period from about October 1 to June 1. If adequate feed had not been available, early calving would have undoubtedly reduced the size of the cows.

1. Calving first at two years of age did not stunt range cows that were well fed during the winter.

2. Conception rate was not high in yearling range heifers, especially smaller and younger individuals.

3. Heifers calving as two-year-olds had difficulties in calving.

4. When both groups were six years of age cows calving first at two years of age weaned an average of 1.03 more calves that were 10 pounds heavier than did cows that calved first at three years of age.

5. Results of this study suggest that if animals are small and if the operator cannot give them attention during calving, it is doubtful if the practice of breeding yearlings is desirable.

6. Ranchers should not breed heifers as yearlings unless adequate feed supplies are available to grow the heifers out to large size at the time of calving.

Farm Machinery in the Fifties

Condensed from The Farmer

L. E. Childers
U. S. Department of Agriculture

FARM equipment development in the United States has come a long way in the half century just ended. A farmer of 1900 could hardly have imagined anything equal to some machines that now are in common use—a modern one-man automatic pick-up baler, for example, or hydraulically operated plows and cultivators, field forage harvester-crushers, or the self-propelled combine. Some other specialty machines like the corn drier, vacuum-type nut harvesters, and sugar beet harvesters would have seemed utterly preposterous.

Science has played its part in increasing farm production and reducing the labor requirements in crop growing, but no one factor has had a greater influence than the improvements in and wide adoption of power machinery. On highly mechanized farms labor requirements for producing and harvesting an acre of wheat are now about 2½ man-hours as compared with 9 in 1900, and the combine has played the most important part in this change. Where full use is made of machinery for producing corn, the labor required is now about 4 man-hours per acre as compared with 15 in the earlier period. The mechanical corn picker has been largely responsible for this change.

In 1938 only 12% of the total corn crop and 28% in the Corn Belt was harvested by mechanical pickers. Now in the big corn producing states practically the entire crop is machine-harvested. The number of pickers on farms is near 400,000, or about four times the number a little over a decade ago.

Further changes in pickers may come out of the experience with wind and corn borers resulting in down corn last fall. These changes may include attachments that will lift down stalks and guide them through the picker mechanisms. Even this will not, of course, solve the problem of salvaging ears broken from the stalks, for which some type of gleaner may be developed. Early models of such machines or attachments were in use even last fall.

The corn borer may force alterations in the equipment farmers use to increase their operating efficiency under the new conditions, and may call for develop-

Reprinted by permission from The Farmer
St. Paul, Minnesota, February 4, 1950

ment of entirely new types of machines.

Shredder-type stalk cutters are already moving into the farm picture in a big way. They operate from the power take-off and spread the shredded stalks evenly over the field for plowing under. The picker-shredder also is in use to a limited extent, and is likely to increase in importance. This machine cuts the stalks and picks the ears as they move through, then shreds the residue. The shredded materials are saved by some farmers for livestock bedding, because of their high absorbency. Advantages of shredding the stalks are that most of the borers which would otherwise overwinter in them are killed or die of exposure during the winter, the residue can be more effectively plowed under, and decomposition in the soil is more rapid than with uncut stalks.

Even with such efficient machines, residue disposal and crop sanitation do not give a complete answer to borer control by any means. Improved types of sprayers and dusters are coming into the picture. As a result of the recent developments in use of chemicals for weed control and other purposes, new concentrated insecticides and fungicides, and the increasing economic importance of such pests as the corn borer, farmers' needs for such equipment have multiplied. With sprayers, for example, the need and trend is toward multiple-use machines adjustable to do numerous jobs. All-purpose crop sprayers seem destined to come into use on an increasing number of farms. Current models feature improved pumps with greater capacity for spray output, positive agitation of spray materials, adjustments for volume and both high or low pressure, and also advancements in hoses, filters or strainers, gaskets, and metals to resist corrosion.

Field shelling of corn may become common practice within a few years. Inasmuch as 60% of the moisture in ear corn is in the cob, leaving the cobs in the field should simplify the drying problem. Research engineers working on methods and procedures of conditioning field-shelled corn have already solved some of the difficult basic problems—which brings field-shelling a step nearer the farm. If this is perfected, it may not be out of the question to incorporate conditioning as a part of the field operation. Far in the future perhaps is a machine that will cut the corn, pick the ears and shell the grain, then load it, shred the stalks for plowing under, cut the corn low so there is no stubble, and perhaps dry or condition the grain for storage—all in one operation.

Mechanical picking of sweet corn is not so well advanced as for field corn, although progress

also is being made with machines for this crop. The difficulty is to pick the sweet corn without crushing or damaging the tender ears. Some machines use snapping rolls as do field corn pickers, but at least one uses a revolving knife that chops the stalk up until it cuts the ear shanks, which frees the ears so they tumble into a conveyor or loader.

Many newer plows, have been designed for undermounting where they are pushed rather than pulled, giving the operator a clear view of the work done and making possible further plowing at row ends. Shapes are changing to permit higher speeds without excessive throw of soil, and for better scouring. In some areas chisels and other types of deep tillage tools such as the double deck plow, to break up hardpan and increase permeability of the soil are increasing in importance. So are tools for mulch tillage, which work the soil but leave the crop residues on or in the surface. In some favorable situations and for some crops once-over seedbed machines are coming into common use.

There also is a tendency toward design for increased speeds for tillage operations, such as cultivation, and for seeding and drilling. Cultivator sweeps and shovels are in some cases flatter in shape so they don't throw the dirt so far at higher speeds, which may range to 6 and 7 miles an hour. Some of the new drills and planters likewise have been developed for operation at increased rates of travel.

Multiple-use phases of equipment are receiving some emphasis, as illustrated in crop driers where the objective of design engineers is a unit that can be used for several crops. Farmers have evidenced some concern at their growing inventory of equipment for efficient operation. In meeting this problem designers are attempting where possible to develop machines that can be adapted for several operations by use of attachments or added units. Several hay choppers, for example, have been so built that they can be used for field chopping of silage by a change of attachments. One new unit in a 1950 line makes it possible to cut and chop green forage with the same machine used in chopping hay and corn silage. Some mowers can now be equipped with windrowers to permit easy loading or field chopping of green forage. Some sprayers are designed for numerous jobs with pressure or volume adjustments by which they may be adapted for applying fungicides, insecticides, and herbicides, and even for such miscellaneous jobs as whitewashing the barn and spraying livestock for parasite control.

In other cases several operating units may be mounted on a trac-

tor to permit several jobs to be done at one time or for alternating one job with another without detaching the equipment from the tractor. For some crops equipment for as many as four jobs may be hung on the tractor at planting time and never changed until the crop is laid by. In such cases replanting of skips in the row may be done along with the first cultivation merely by lowering the planter into working position. All of this has the objective of making more efficient use of the available power for the lighter operations. Increasing speeds are being used for these tasks for this same reason.

On the other hand, farmers have demonstrated that where a machine is used throughout a long season or for several crops they will go for anything that will increase efficiency—which is in accord with the old better-mousetrap principle. Self-propelled combines are finding a ready market, for example, because these machines go into use with harvest of the small grains in the spring and summer, are later used for harvesting seeds of clovers or alfalfa, then for grass seeds and soybeans, and on some farms may finish the season and go into storage only after the last of the grain sorghum is threshed just before snow flies. Other equipment also has been self-propelled for the same reason where a long season of use may justify a heavier investment.

As with other machines, tractors also are showing the influence of modern needs. Gradually over the last 50 years they have decreased in size while the ratio of power output per pound of weight has increased. Operating speeds have also increased. The latest in tractors are, of course, the small field sizes adapted to farms of 80 acres and less, with a range of equipment for doing many jobs.

Influences of multiple-use design are also to be seen in the new tractors. A few years ago before the Society of Automotive Engineers, A. W. Turner of the Agricultural Research Administration of the Department of Agriculture led a discussion of the desirability of tractors with equal forward and reverse speeds and with increased adaptability for farm work. He pointed out that the horse and automobile too long have influenced the design of equipment and farming practices generally.

Granting that radical changes in design would not be desirable or advisable, the discussion centered on a universal type of power unit on which would be mounted any or all of the various operating machines for crop production and harvesting in such a way that tractor and equipment would function as an integrated, close-coupled, and load-distributed machine. It would have equal facility and efficiency with operating

equipment located ahead, behind, or in the center with respect to the power plant depending on which was the best position for the operation and with the operator facing either way as convenient.

Such a tractor has not yet appeared and it may be years before anything of the kind is developed, if ever. However, the newer models are approaching this ideal much more closely than those of a few years ago, especially in smaller sizes.

Conservation farming has become a permanent part of the agricultural pattern. Its spread has emphasized certain equipment needs on farms. An outstanding example is a precision planter for grasses and legumes.

Conservation practices have, of course, affected machine design as well as the kinds of machines on farms, and will continue to do so. The two-way plow, for example, has assumed greater importance in some areas in recent years. Earth-moving equipment also has become a common part of a farmer's complement of machines. Farmers are learning, however, that the change to conservation farming does not necessarily require a large additional outlay for new equipment, but rather the efficient use of that which they already have. A farm that is already well equipped for power operation will also have the power and most of the equipment to build and maintain terraces, ponds, and waterways and to carry out other features of a well-developed conservation plan.

Farmers who use modern power-operated haying equipment have found they can reduce labor and time requirements while they are also reducing losses of hay as a result of bad weather. The newer machines likewise are being designed to handle forages with as little shattering of the leaves as possible. Advancements in recent years have run through the entire list of machines from mowers to automatic balers, choppers, and green-forage harvesters. Again the emphasis is on speed of handling and methods that decrease nutrient losses. Farmers have become increasingly aware of losses in feeding values between the time of cutting and feeding, which experiments have shown may run as high as 90% of the vitamin A and 50% of the protein. The modern balers, choppers, green-forage harvesters, and harvester-crushers aim to cut down these losses and speed the forage to the barn or silo.

Farm machinery of the future will also be quieter, more comfortable, and will give longer service, according to information coming from laboratories of the rubber industry. Use of rubber in farm machinery has grown rapidly but there are still hundreds of places

where it may be used for greater comfort and longer wear with elimination of shock and vibration. Rubber torsional springs are recent developments. They take many of the jerks and bumps out of riding a tractor. Wherever possible, equipment also is being engineered for greater safety. One of the newest features for safety of the operators of farm equipment recently developed which manufacturers are adopting is a non-removable power take-off safety shield. It is a result of an industry-wide cooperative effort on safety features.

In the main, advancements in farm machines come slowly. New and radical designs are introduced only after years of research and field testing. Over the long years, however, there are some events that stand out as milestones of progress. Among these might be listed the invention of the first steel plow, the introduction of the reaper, the perfection of the internal-combustion tractor, and the adoption of rubber tires. The period since the end of the war has been marked by a number of such major advancements, among the outstanding ones being the development of field tractors and equipment for small-size farms and introduction of hydraulic controls and the free-running power take-off. While a number of new units are being added to existing major lines, present indications are that the 1950's will be marked mainly by numerous improvements and perfections on existing machines.

Easy Way to Save 50 Pounds Milk Per Calf

It isn't often that you'll find a way to save two tons of milk a year, even in the biggest herds. But Ohio State University did it last year by feeding surplus colostrum to their 76 calves. They take the new-born calf away from the mother before it nurses, and milk the cow by machine. The calf gets colostrum the first three days, all right, but what he doesn't drink goes to the other calves. He, in turn, is likely to find surplus colostrum in his regular feeding any time during his first two months.

—Farm Journal

Lespedeza Sericea for Papermaking

Condensed from Chemurgic Digest

Dr. Reavis C. Sproull and Frazer Banks, Jr.
Southern Research Institute

THE Southern farmer of today is becoming more research minded. As cotton slowly gives way to the diversified crop system now extensively underway in the Southern states, it is natural for the farmers of this region to look to research to supply them with answers to the new problems which arise and to help develop more valuable uses for their new farm products.

Such a farmer is Mr. E. H. Pearson of Autaugaville, Alabama. It is through his interest in a comparatively new crop—Lespedeza sericea—and his active cooperation with Southern Research Institute at Birmingham, Alabama, that a possible new product is being developed for the modern Southern farmer.

Lespedeza sericea is currently being used as a soil builder, to prevent erosion and to return organic matter to the depleted soil; as a plant for grazing during the early spring and summer; as a hay crop in the fall; and as a seed crop in the early winter.

Sericea grows both from the root and the seed. By the second year, the sericea field is completely covered with the thick matted legume. Maximum growth is reached the third year; here the matted appearance of the uncut field increases, to the almost complete exclusion of weeds. Once fully established, Lespedeza sericea continues to come up year after year. A twelve year old sericea field is just as hardy and thick as a younger crop. The individual stalks grow to a height of about four feet and are woody in appearance. The upper one-third of the stalk has branches covered with small, green leaves during the growing season.

Because of the deep root system, extremely dry weather has little effect on sericea growth. This same root system rapidly returns nitrogen from the air to the soil. Fields once depleted by the one-crop system have been reclaimed after three or four years of sericea growth. A mature sericea field, besides refertilizing the soil and supplying excellent grazing land, will yield a hay crop of one ton per acre and a seed crop of 400 pounds per acre.

In this sericea cycle—from the planting in the late winter

Reprinted by permission from Chemurgic Digest
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through the grazing, hay and seed crops—one missing link appeared. When sericea reaches maturity in the fall and the seeds are removed, hard stalks remain. These stalks average 30–40 inches in height and about ¼ inch in diameter. They are woody in appearance, with only a small amount of pith and bark. The estimated yield of these stalks is 4,000 lb./acre. At the present time, they are not only being wasted, but are actually a detriment to the farmer, for they must be cut and removed from the field by raking or burning. Otherwise, the hard stalks would interfere with next year's hay crop, since they will not rot during the winter.

It was with this problem that Mr. Pearson came to Southern Research Institute. A preliminary investigation with limited funds has shown that a fair grade pulp and paper can be produced from these sericea stalks. Commercial application of this process should prove of great value to the farmer and the paper manufacturer.

The importance of fibrous raw materials from agricultural residues is becoming more evident as the abundance of virgin timber decreases. In addition to aiding the conservation program, these pulps lend their own special characteristics to producing paper products of a desirable quality. Some successful commercial enterprises already built on these special properties are the production of high quality insulating board from sugar cane bagasse, of cigarette paper from flax straw, of thin book and bible paper from esparto, of electrical insulating paper from hemp and caroa, and corrugated paper from wheat straw. Pulps from agricultural residues are also blended with conventional stock to develop properties not attainable by the use of a single pulp. Blended pulps will be used to an even greater extent as more specialty papers with narrower specifications are required by the American consumer.

The chance of a new income has given the farmers of Autauga County an opportunity not only to cooperate with research, but also to do research themselves. While Southern Research Institute is working on various methods of reducing the sericea stalks to pulp and paper, these farmers are investigating the agricultural end of the picture. This means encouraging more farmers to experiment with sericea; trying various fertilizers for best growth; combining it with different winter clovers to help expand the usefulness of sericea fields; and developing new techniques of planting, grazing and harvesting.

Mr. O. H. Pigford, head of the Pigford Farm Equipment Company of Prattville, Alabama, is

modifying existing machinery for harvesting sericea in its various forms. The seed crop is gathered in the fall with a conventional harvester set to cut the upper one-third of the stalks. For harvesting the stalks, he plans a pick-up baler with sickle bar attachment and a device for loading the sericea bales on a truck. These bundles would be about thirty inches long, weighing fifteen to twenty pounds.

No curing process is necessary, because the sericea stalks are already dry. The bales can be stored immediately after harvesting for long periods of time without showing and decomposing properties. Because of this resistance to decay, the uncut stalks can be left on the field during the winter months. This easy cutting and storing schedule would enable the farmer to coordinate better the supply of stalks with their demand by the pulping mills.

The entire harvesting operation would require a two-man crew, harvesting at an estimated rate of 15 acres per day and at an estimated cost of $5.00 per acre. Compare this simplicity of harvesting and storage with the operation required for straw, an agricultural residue now used successfully for pulp and paper. The straw must be raked and baled soon after cutting to prevent spoilage. Curing is also necessary and, even under the best conditions, straw cannot be stored for long periods of time.

Other farmers are working on the effect paper from sericea stalks would have on agricultural planning. At present, since they are a surplus crop, the sericea stalks are kept as short as possible. This is done by extensive grazing and a large hay crop. If demand is created for the stalks, the missing link will be found, but at the same time agricultural thinking will have to be modified. The extensive grazing will have to be reduced slightly and the fall hay crop greatly reduced to enable the stalks to reach their best height for paper stock.

These potential changes have led many farmers to experiment on combining sericea with various types of winter clover. If the sericea fields can be used for winter grazing, the loss of the large hay crop from sericea will not be felt. These farmers have found that Manganese Bur clover combines successfully with sericea to give a three months' winter grazing crop far more valuable than the lost sericea hay crop. Experiments are also being conducted with Kentucky 31, Crimson Reseeding and Hop clovers.

The new cycle of growth for sericea—with the paper industry filling a very important gap—would then be refertilization, grazing in the summer, seeds for replanting and stalks for pulp in

the early winter and a clover grazing field during the winter. This cycle would be complete; a new source of income would exist for the Southern farmer; and a valuable new fiber would be available for the paper industry.

On the question of continuous and large supply, always important when a product shows potential use in an old and established market, sericea again shows up very well. In Autauga County alone, its acreage has increased from 20 acres in 1940 to 8000 acres this year. Mr. Charlie Breedlove, County Agent, estimates that 30,000 acres of marginal land in that County ought to be planted in sericea within the next five years. Helped by the present government subsidy on sericea planting, the farmers will plant these wasted acres, even with no demand for the sericea stalks. If this demand is created, the acreage would naturally be increased tremendously. Because of its hardiness, sericea cultivation is not limited to the Southern States; it can be grown in any type soil and as far north as Michigan. It is principally in the South, however, that marginal land, long rendered useless by the one-crop system, is being turned over to sericea in ever increasing amounts.

Paper from sericea stalks is being made at Southern Research Institute by different cooking techniques. Standard and mild kraft cooks, with sodium hydroxide and sodium sulfide, have been made; the stalks have also been reduced to pulp by the lime-sulfite method, using lime and sodium sulfite. Semi-chemical processes, with sodium chlorite and with lime, produced a fine pulp for low cost products. The soda-chlorine process, in which stock is passed continuously through alternate sodium hydroxide and chlorine towers, produced a white, high grade pulp.

No debarking is necessary for these cooks and, because of the small amount of pith, the chemical consumption is low. With proper control, it should be possible to greatly reduce the time of the beating operation, standard for all wood stocks. The fibers produced by these experiments were short and had a high gloss. Conventional bleaching methods easily bleached the pulp to the desired whiteness.

This bleached pulp, when blended with longer fibered pulps to give the needed strength, makes a high quality product suitable for many of the special uses found for paper today. Paper from sericea pulp may also compete in such articles as corrugated paper, packing crates and fiber board.

The cellulose content of Lespedeza sericea was found to be 45% using sodium chlorite as bleaching agent and 42% where nitric

acid was used. Standard analytical procedures were followed. Assuming a 50% yield of pulp by any of the chemical processes described, the yield of pulp stock per acre would be 2000 pounds. This compares favorably with the acreage yield of pulp from pine forests, where ten years' growth for maturity is required.

Other possible uses for sericea in various stages of growth may develop as more research is done on the plant. Other legumes have yielded valuable hormones, minerals and vitamin mixes; these may be obtainable from sericea. The unusual dryness of the stalks suggests that extractions may yield tannins, oils or waxes of a special interest. Use as a source for rayon and other regenerated cellulose products is also being considered. Sericea stalks may find use in such varied products as dowelling, roofing felt and laminates.

In must be emphasized that the experiments of producing paper from the wasted sericea stalks at Southern Research Institute are still in the preliminary stages. An estimated year's work is necessary to prove that this process is sound. At the present time, the funds for this work are not available. A step has been made, however, toward combining long-range agricultural planning with active research to the ultimate benefit of the Southern region.

Gutter Cleaner Distributes Bedding

The gutter cleaner that Parsons Brothers put in their dairy barn, Bay county, Michigan, also carries chopped bedding to cow stalls. A pile of straw is thrown down between the spreader and the first stall. When the cleaning job is about half done, a man begins pushing bedding into the gutter. By the time straw reaches the last cow stall, all manure is in the spreader. When the cleaner stops, there is enough bedding behind each cow to last until the next cleaning. It takes only a few minutes to fork it into the place.

One man used to spend 3 hours a day cleaning two 110-foot gutters, hauling manure and bedding the herd. Most of the time was spent getting manure from gutters to spreader. Now in less than 20 minutes all manure is on the spreader and bedding is in place. The machine does a better job than can be done with a shovel.

A 1½-horse electric motor operates the cleaner.

—Cappers Farmer

Pheasant Raising Is Profitable

Condensed from American Poultry Journal

Ralston R. Hannas

If there is anyone who thinks pheasants can't be raised domestically, he should visit the farm of Don Anderson, North Branch, Minn., where over 4000 Ringnecks are raised. Mr. Anderson has been raising them for 17 years and has developed many "kinks" of his own that come only with experience and are essential to success.

The farm is 10 acres in size, and while the breeders are kept in quarters that are probably better than the birds would have if they were running wild, natural conditions are maintained as far as possible, particularly on the growing range. Ringneck pheasants—birds that have been crossed with the Formosan, Mongolian and Chinese breeds—are raised. A larger bird results from this cross, as well as a bird that is less cannibalistic than other breeds. These hens will lay longer; they lay on the average of between 60 and 70 eggs a season.

There are 252 selected breeders kept: 36 pens of 1 cock and 6 hens each. They are mated in October and they live together as a family. The laying season is from the middle of April until the middle of August. It is interesting to note that you can't trapnest pheasants, so breeding selections are made on the basis of external appearance.

Yards are wired over the top as well as the sides, and water elm is used as the lumber to which wire is fastened. This lumber, as its name implies contains considerable moisture and does not break easily. For this reason, it is ideal to support the wire covering of the yards, since the snows in Minnesota are heavy, resulting in a tremendous weight. There is a total of 210 pens on the farm.

According to Mr. Anderson, no pheasant ever freezes to death if it is fed right—they only freeze when subjected to wet sleet if they are half-starved.

Each pen for the breeders allows 35 sq. ft. of ground area per bird, while the growing pens allow 60 sq. ft. per bird. There are 7 adult birds in a breeding pen and 20 growing birds to a rearing pen.

Mr. Anderson has 5 incubators of 4000 egg capacity; he runs 16 hatches a year, one each week. The usual rule is to set three times as many as you expect to rear to

Reprinted by permission from American Poultry Journal
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maturity. He raised 91% of those hatched in 1949. They hatch at about half males and half females.

Brooding is done in electric brooders, as many as 240 chicks to a house. When asked about feeding pheasants, both young and old, Mr. Anderson pointed out that there are commercial feeds on the market especially for game birds and pheasants. Chicks are started on mash and at 4 weeks they can be changed to grain, on which they are kept until maturity. Chicks are kept in the brooder houses from 4 to 6 weeks depending on the weather. At 6 weeks, a pheasant breeder can guarantee sexing by the feathers. On the Anderson farm no sick pheasant ever gets well; he kills it so that there are only healthy birds.

Adult pheasants are fed laying mash in the laying season. Some growers, however, feed their layers both grain and mash.

Pheasants breed pretty true to color. However, once in a while a white one appears. Such a bird is called a sport. Only once in Mr. Anderson's 17 years of raising pheasants has this happened.

As to the market, 50% of the pheasants are sold alive either as breeders or for stocking a preserve, and 50% are killed, dressed and sold as meat. Those sold as meat are shipped fresh dressed, i.e., New York dressed, or dressed and drawn. Dressed weight is about 3 lbs. for males and 2 lbs. for hens. When drawn, they lose about 25% in weight.

Mr. Anderson is continually increasing the weight of his birds each year by selection and breeding. He now has some birds that have gone 4 lbs. and 14 oz. New York dressed and expects to reach 5 lbs. very shortly.

He ships small orders special delivery parcel post through the 4th zone (about 500 miles), also special delivery air parcel post anywhere in the United States. The large orders of freshly dressed birds are packed in dry ice and shipped by Railway Express. Some orders are shipped by private plane.

Birds are sold by the piece or by the pair: dressed and drawn, shipped parcel post. They may be sold alive in lots of 100 or more and are shipped express collect. Pheasant broilers are also sold, weighing about a pound and a half.

There is a good demand for pheasants, and pheasant raising is profitable. But Mr. Anderson points out that pheasants stay wild and have a tendency to be very cannibalistic.

Next Summer's Rain

Condensed from Electricity on the Farm

Geo. W. Kable

THIS article will give you some "straight-from-the-shoulder" facts. We are not trying to "sell" you on irrigation. What we want to do is to help you decide and to "go right" if you are interested.

Irrigation, will cost you money. For a sizeable acreage, it will mean a major investment. If you do it right, there is always an opportunity for a good profit. In other words, applying irrigation water should be considered in the same class as applying fertilizer, buying a tractor or combine, or feeding concentrates to your dairy herd. If you "mean business" you can operate on 100 acres or on a 1/10th acre garden plot, and make a profit.

Annual rainfall has little relation to the need for irrigation. It is the time the rain comes that counts. In some places good crops are produced on 20 inches of rainfall. In some counties in Western Oregon where the rainfall averages as much as 80 inches per year, summer pasture irrigation pays because the rain all comes in the winter. There is hardly a section of the United States where there is not a dry period, or several of them, during the growing season.

There have been an increasing number of pastures irrigated. Sprinkler systems have made it possible to irrigate them with only one or two hours' attention per day.

There are some differences between Western (arid) and Eastern (humid) irrigation which should be made clear.

On arid land, irrigation is a necessity. No water—no crop. The cost of getting water on the land may be many times the cost of the land, itself. Arid soils are usually deep and reasonably smooth. Because of this, the surface soil may be moved to level the land without destroying its productiveness. It has been common practice to apply the water to the fields from ditches by flooding or down rills or through furrows between rows. Where the water supply is limited, or where it must be pumped, surface irrigation methods are being replaced by sprinkling. Because sprinkling applies the water more uniformly, less is wasted and there is less erosion of the surface.

Reprinted by permission from Electricity on the Farm
New York City, New York, February 1950

A noteworthy difference between western and eastern irrigation is that pumps in the dry western regions are operated almost continuously for four to seven months out of the year. The pumping equipment must be highly efficient to keep down costs. It must be carefully selected to fit the requirements of water table, discharge pressures and quantity. Three phase electric service is available to most farms. It is not uncommon to find several hundred horsepower in pump motors on one farm.

Typical of a western irrigated region is the territory of the Pacific Gas and Electric Co. in Central California. Mr. E. G. Stahl, Manager, Agricultural Sales, gives these figures. Of the 81,000 farms in the area, 60,000 are irrigated and 21,000 dry farmed. P G & E supplies power for pumping to 73 per cent of the irrigated farms; 27 per cent are irrigated by gravity flow. Crops irrigated on these farms are

Crop	Number of Farms
Field crops	18,757
Truck crops	8,030
Fruits and nuts	37,103
Pastures	12,000
Farm gardens	40,000

In the humid, or semi-humid, areas of the country, water is more plentiful. Top soils are usually too thin for leveling. Water has been applied to truck crops chiefly by the Skinner system of irrigation. It consists of lines of ¾″ or 1″ pipe several hundred feet long on supports above the field. The pipes are tapped on the sides and supplied with spray nozzles. By oscillating the pipes the spray covers a width of 30′ to 40′. In recent years portable pipe and rotating sprinklers have been gaining in popularty. A relatively small amount of irrigation is done using perforated pipes or canvas hose laid on the ground. First costs may be lower, but replacement costs and labor are usually higher, and the distribution of water not so good.

First costs of equipment in humid areas are perhaps more important and operating costs less important than in arid regions because the equipment is used a much shorter time during the year.

The main purpose of irrigation is to increase yields. Other results, however, may be almost as great. The quality of vegetable and fruit crops is improved by keeping them supplied with moisture so they can grow continuously through the season. Quality means money on the fresh market or at the cannery. Irrigation often prevents complete crop failure due to unexpected periods of drought. Milk flow is maintained when pastures normally fail in dry periods. Irrigation systems have saved crops by raising temperatures just enough on cold nights to prevent frost injury. In the last year or two, irrigation has been saving the cost of

applying fertilizer by feeding the fertilizer in liquid form into the irrigation water.

In Aroostook County, Maine a number of growers report increased yields of potatoes of 40 to 100 barrels per acre. In some cases the crop was doubled over the average of the preceding 4 or 5 years. They used portable pipe and big sprinklers.

Long Island and New Jersey have many overhead pipe and portable pipe sprinkler systems on truck and cannery crops. Some are used for pastures.

The Georgia Agricultural Extension Service reported 46 cows grazed on six acres of irrigated natural grasses and lespedeza during extreme droughts. The milk production held up and pastures remained good. Twice as many beef cattle were carried per acre during droughts than could be grazed on dry pastures.

The supply of water is most important in irrigation. There must be enough. It should be near the point of use to keep down pipe and pumping costs. It must contain no harmful chemicals, and be clean enough so it will not clog pipe lines and sprinklers. Streams and natural lakes are excellent. Wells are good, where you are sure there is a plentiful ground water supply at not too great a depth. Artificial ponds made by damming small streams or making excavations in natural drainage basins are used successfully.

It takes a lot of water to grow plants. Nature normally provides about 40″ depth of rain over the land. For supplemental irrigation in the East we may use 4″ to 18″. In arid regions from 20″ to 48″. An acre contains 43,560 square feet, and it takes 3,630 cu ft or 27,200 gallons of water to cover it an inch deep. In terms of flowing water it will take about 450 gallons *per minute* to cover an acre an inch deep in an hour. Or to put a depth of 2″ of water on an acre in a 10 hour day would require about 90 gpm.

Before ordering irrigation pumps you should have your well or stream tested to be sure of the quality of water available. The well test should continue until the quantity delivered remains constant. The depth to water in the well should be measured while the pump is still running.

In building ponds it is best to make them quite deep as you will have less surface evaporation. If you wish to store water to put 12″ of irrigation on 5 acres, your pond would need to be an acre in area and an average depth of about 6′ to allow for some seepage and evaporation. You should have from 4 to 15 acres of drainage area to feed the pond for every acre-foot of water to be stored. The number of acres will depend on the slope of the land, its vege-

tative cover, the type of soil, the rainfall and the tightness of the pond.

For those interested in garden irrigation, a large farm water system delivering a full 500 gphr would irrigate 1/10 acre with 2″ of water in about 12 hours.

Centrifugal and turbine pumps are generally used where large quantities of water are pumped for irrigation. Single stage centrifugals should be placed so they will have no more than a 15′ suction lift from the water. They will discharge against heads of 200′ or more. In capacities they range from as little as 20 gpm to any size desired.

Vertical turbine pumps are the deep well irrigation pumps. The pump goes down in the well casing and is connected by a vertical shaft to the motor at the surface. They go into casings of 4″ diameter upwards. Capacities and discharge pressures may be most anything desired. Pumps of this type are made for motors as large as 700 horsepower.

Submersible turbines have the motor directly connected to the pump. Both pump and motor are lowered into the well, eliminating the long drive shaft.

When farm water systems are to be used for garden irrigation, it is better to have one of the larger capacity units. In order to make the best use of the system, pipe and hose should be large enough so water friction will not cut down the capacity of the pump.

The power required for operating an irrigation pump depends on:

1. The lift from the water to the field.
2. The pressure at which the water is delivered to sprinklers etc.
3. The friction loss through pipes and fittings.
4. The efficiency of the pumping unit.

If it takes 2 hp to lift water 30′, it will take 4 hp to lift the same quantity 60′. Pressure in the system adds quickly to the power requirements. Every pound of pressure in the pipe is equivalent to an additional lift of 2.3′. If you pump against 100 pounds pressure that is the same as adding 230′ to the lift. Friction through pipes is a dead loss. It takes power to force water through small pipes and around bends. For example, forcing 100 gpm through 1000′ of 2″ pipe would create a friction loss equal to lifting the water about 270′; if 3″ pipe were used, the loss would be equal to lifting 40′; with 4″ pipe, only 10′. In selecting pipe sizes, therefore, one must balance the first cost of the pipe against the cost of pumping water through it.

Overall efficiency of pump and piping is not so important from the standpoint of pumping costs in Eastern irrigation as in Western, where the pumps are used many

more days per year. Efficiency is important, however, in keeping down motor sizes to those which can be used on single phase lines. Motor, pump and pipe sizes may also be kept down by irrigating 24 hours per day instead of 8 or 12 hours, during those periods when water is needed.

Portable aluminum pipe and quick couplings are becoming very popular for new irrigation.

More Profit from Hogs

Condensed from The American Hampshire Herdsman

Dr. John F. Lasley
University of Missouri

For a sow to be an efficient producer, she must possess the ability to farrow large, healthy litters which survive and make rapid and efficient gains to market weights. The efficiency of production of sows has been improved to a considerable extent by attention to environmental factors such as management, nutrition, sanitation and disease control. Yet, further improvement in production efficiency is to be desired. Records show that only 6 to 6.5 pigs per litter are raised to market weights each year. However, on certain farms where more efficient production methods are followed, as many as 8 to 10 pigs or more are raised from each litter. Therefore, it is evident that larger litters can be raised if proper methods are followed. Figures from many sources show that approximately one-third of all pigs farrowed die before they reach market weight. This large loss accounts for a considerable portion of the decrease in litter size up to market age.

Even if a large number of pigs is raised, considerable variation exists in the rate and economy of gains of fattening hogs. This may be true even in litter-mates. Record of performance studies at various stations have shown that purebred animals fed under identical conditions may vary from 350 to 500 pounds in the amount of feed required to produce 100 pounds of gain. Therefore, there must be some factors other than environment which influence the rate and economy of gain in the feed lot.

This side of the picture has not been studied to as great an extent as some of the environmental factors. Perhaps this is due to the fact that breeding and feeding records have not been available. Such records have been obtained in the

Reprinted by permission from The American Hampshire Herdsman
Peoria, Illinois, February 1950

Regional Swine Breeding Herds at the Missouri Station. They may be used to illustrate the value and use which can be made of such records as a basis for selection and improvement of swine.

From an economical standpoint, large litters are necessary to meet the cost of feeding and caring for the sow. A sow which produces large litters at weaning requires no more care and probably no more feed than does one which produces small litters. If the cost of maintaining the sow is divided among the pigs at weaning time, it is evident that the pigs from the larger litters have cost the producer much less than those from the smaller litters. This was demonstrated in studies at the Iowa Station where it was found that in a litter of 2 pigs, each pig should be charged with 458 pounds of feed at birth and 661 pounds at weaning. On the other hand, each pig from a litter of ten should be charged with 92 pounds of feed at birth and 132 pounds at weaning. Pigs from very small litters may never gain enough to meet costs by the time they reach market weight.

Litter size is sometimes influenced by lowered fertility in the boar. Only a small percentage of sows which are bred to a boar of lowered fertility conceive at the first service. Furthermore, there have been instances in which the litter size was reduced to 2 or 3 pigs at farrowing when the sows were bred to boars of low fertility. On the other hand, evidence indicates that boars of normal fertility have little or no influence in litter size since they produce many millions of viable spermatozoa during a single service. Only one viable spermatozoa is needed to fertilize each of the ova shed at the time of ovulation. This does not mean that it is desirable to use boars from a line of breeding which consistently produces small litters. The small litter size in such lines may be inherited. A fertile boar of such breeding will not influence litter size in those bred to him, but his daughters may be poor producers. It should be remembered that one-half of the daughter's inheritance comes from the sire.

Gilts and sows control the size of the litter by the number of eggs they shed at the time of ovulation. Studies at the Missouri Station have shown that in one line of hogs, an average of 16.1 eggs were produced at ovulation in mature sows. Of this number, 1.2 eggs, or ova, were never fertilized by the spermatozoa. Furthermore, 6.6 embryoes failed to survive until 25 to 30 days and an additional 1.2 embryoes died after 25 to 30 days and before farrowing time. Therefore, litter size may be reduced as much as 50 per cent before farrowing time. When we consider that another one-third of

the pigs may die before weaning, it can be seen that the death loss is terrific. No doubt there are many factors which are responsible for this loss. Studies have shown that age and amount of inbreeding are important. It is possible that nutrition and management may also be involved although these factors have not been studied.

Litter size may also be affected by the number of services given the sow during the heat period. Heat, or estrus, in the sow may last for a period of 2 to 4 days and ovulation is thought to occur during the latter part of the heat period. When sows or gilts are given only one service during the first part of the heat period, the spermatozoa may die before the eggs are shed and the sow may fail to settle. It is sometimes beneficial to give two services at intervals of 12 hours during the heat period. Results obtained at the Missouri Station have shown that 90 per cent of gilts bred twice during the heat period settled at the first service as compared to only 72 per cent of those receiving only one service. Those gilts which were bred twice produced an average of 1.1 more pigs at farrowing time than those which were bred only once. While these data indicate that better results may be obtained when gilts are bred twice, this would depend on the amount of use that can be made of the boar. Under no circumstances should he be overworked.

The level of productivity of the sow may influence the size of the litter at both farrowing and weaning time. A sow that produces large litters at her first farrowing, tends to continue to produce large litters, while sows which produce small litters also tend to farrow small litters. When a group of sows was rated as good, medium and inferior on the basis of production records, the good producing sows had more than twice as many good daughters as did those in the other two groups. Boars and gilts to be saved for the breeding herd should be selected from sows that are good producers.

Litter size influences the efficiency of pork production. Within certain limits, large litters result in more pigs being raised to weaning, although the percentage of pigs lost up to that time is slightly greater than in smaller litters. The size of the litter at birth has very little effect on the birth weight of the pigs. Studies have shown that pigs from litters of 10 or more averaged 3 pounds at birth. This was from 0.1 to 0.3 of a pound less than pigs from smaller litters. Pigs from larger litters weigh about as much at weaning time as do those from smaller litters. Because of this fact, the total weight at weaning is highly in favor of the larger litters.

Available evidence indicates

that those pigs which are larger at birth are more vigorous and grow more rapidly than smaller pigs. A one pound advantage in birth weight was found to result in a seven pound advantage at weaning time. Between 80 and 90 per cent of the pigs weighing less than 2 pounds at birth died during the suckling period. Since the smaller pigs also gained less efficiently, this would suggest that it might be profitable to dispose of the very small pigs at farrowing time, especially in large litters.

The size of the pig at weaning is a reflection of both the capacity of the pig to grow and the ability of the sow to produce a liberal supply of milk. In studies at Missouri it was found that those pigs which grew more rapidly to weaning time, also made more efficient gains and were heavier at 6 months of age. Pigs weighing 50 to 55 pounds at weaning gained at the rate of 1.6 pounds and weighed 254 pounds at 6 months of age as compared to a rate of gain of 1.4 pounds per day and 189 pounds at 6 months for those pigs which weighed only 15 to 20 pounds at weaning time. Or stated in another way, the larger pigs at weaning required 54 days less time to reach a weight of 225 pounds than did those which were much lighter. This was found to be true even in pigs from the same litter.

Few teats improperly spaced result in the milk supply being reduced, consequently the pigs make less efficient gains. Sometimes the nipples of a sow are not normally developed but turn back into the surrounding tissue rather than protruding outward so that they can be nursed by the pigs. These nipples might not function even if it were possible for the pigs to nurse them. When the number of live pigs exceeds the number of functional teats, litter size will be reduced accordingly, unless the extra pigs are raised on another sow. In one case, a sow farrowed a litter of 14 strong pigs but raised only 4 because she had only 4 functional teats.

Inverted nipples were found to be inherited. A boar possessing this trait also passed it on to his daughters. The occurrence of inverted nipples in gilts usually could be detected early in life before they were bred. As a result, it was possible to cull these from the herd.

One other abnormality observed was mastitis of the mammary gland. Affected glands became greatly enlarged and feverish, and were apparently painful to the sow. Other teats not affected continued the production of milk but apparently on a reduced scale, because the pigs were usually small and unthrifty at weaning time. When the teats were removed surgically the sow usually recovered and produced milk normally during future lactations.

The foregoing evidence indicates that there are many characteristics which are inherited and are passed on from the sow to her offspring. By keeping complete and accurate records, the more productive animals can be detected and their offspring kept for the breeding herd. The registry of merit activities of the various breed associations are helpful in obtaining useful production records. To meet these requirements it is necessary for a sow or gilt to produce and raise large litters which make rapid growth to weaning time. Since weaning weights are an indication of milk production in the sow and growth efficiency in the pig, this is important as a means of selection. However, these records should be supplemented by records obtained after weaning to obtain valuable aids in the selection of more efficient animals for the breeding herd. Of course the hog man should not select for efficiency of production alone, but should consider type along with the other characteristics.

The selection of breeding stock on the basis of production records is being recommended by the Extension and Animal Husbandry division of the University of Missouri. Many producers are demanding tested breeding stock and purebred breeders are beginning to take note of this fact. This same situation no doubt exists in other corn belt states.

The accumulation of knowledge of swine production methods based on experiments in nutrition, management, disease control and sanitation have resulted in more efficient pork production. When the best possible use has been made of this knowledge, further improvement can be made only by selecting those animals for the breeding herd which are prolific and possess the inherent ability to make more rapid and efficient gains.

Use a Soil Packer On Legume Seedings

Maybe you've wondered if it does much good to use a soil packer on a spring seeding of alfalfa.

At the Minnesota Experiment Station, harrowing the seed into the soil without packing gave 21 alfalfa plants per square yard. Where the harrow was followed by a soil packer, the stand averaged 56 plants.

—Farm Journal

Periodic Ophthalmia

Condensed from The Tennessee Walking Horse

E. Carter Foster

ONE of the worst horse diseases today is Periodic Ophthalmia, or *Moon Blindness*. It is one of the oldest diseases we know, being described by authors of the fourth century with such accuracy as to leave no doubt that it was the same disease we have today. During the middle ages it was mentioned by writers of many countries. All of those early writers thought it was caused by the moon, and many years later it was thought to be caused by a germ or virus, and now we think it is a vitamin deficiency.

The care of horses has improved and medical science has made tremendous advances since those early days, but Periodic Opthalmia has steadily increased. The British army records that during the South African war of 1889 to 1902 they took to South Africa from America 109,739 horses. Moon Blindness (Periodic Ophthalmia) was before that unknown in South Africa, but the British lost thousands of these horses from blindness caused by this disease. One remount was 48% affected, but the natives' horses were free from it. By this time the old idea, that the moon was the cause of it, had given way to the theory that it was a contagious disease. The British, working on that idea, shot or isolated the affected horses to prevent the spread of the epidemic, but were very much baffled by their inability to check it. The report records a strange thing in that the disease would break out among horses that had not been exposed to it, and other horses exposed to it a long time never got it. Two years after the war 14% of all the military animals in that end of the continent had Periodic Ophthalmia, representing over 2,000 cases. The native horses were not affected, and four years later it had practically disappeared from South Africa. By then things were back to normal, and the horses were all off of the army rations, and eating what the local horses ate (pasture mostly). Horses on pasture are seldom bothered with Moon Blindness.

We had very much the same experience during the first World War. Periodic Ophthalmia was such a serious problem in the Allied armies that it was the sub-

Reprinted by permission from The Tennessee Walking Horse
Lewisburg, Tennessee, January 1950

ject of a British-French conference of veterinary officers in Paris in January, 1918. In the Philippines in 1923–35 inclusive, our military animals had an average annual rate of 23.79 new cases per thousand horses and 8.23 per thousand mules, which was three times as high as the average annual rate among military animals in the U. S. during the same 13 years. It seems that Moon Blindness gets worse as soon as we ship horses overseas.

Just before the second World War there was quite a concentration of horses at the Remount Depot at Front Royal, Virginia, and General R. A. Kelser, Chief of the Veterinary Corps, recognized a great opportunity to establish a research laboratory to study Ophthalmia and other horse diseases. This was done in 1939 under the direction of Major T. C. Jones, V.C., who had an able staff of assistants, among whom were Major Fred D. Maurer, V.C., and Captain T. O. Roby, V.C., and Master Sergeant Charles A. Barton.

By this time the rate of new cases in the U. S. had risen to twice what it was in the Philippines twenty years before when it was then three times the U. S. rate. These men went after this Ophthalmia problem in earnest, conducting experiments on a larger scale than ever dreamed of before, using thousands of horses in their experiments. During the course of this research there were 15,000 horses at the remount, as many as 5,000 at a time. At the peak they had more than 1,400 horses in the experimental groups. Major Jones performed 440 autopsies. These men thought it was a contagious disease and set about to find out how it was carried from one horse to another. They isolated hundreds of horses and they exposed hundreds to the disease. They stood sound horses and affected horses in alternate stalls, ran them together in the same paddocks and fed them together in the same troughs. They even took tears from the inflamed eyes of affected horses in all stages of the attacks and put the liquid in the eyes of sound horses and in the feed of sound horses. They tried in every way possible to spread the disease to the sound horses in the experimental groups, but in spite of all this the relative number of new cases was no greater than among horses isolated from the disease. The only thing that changed the rate of new cases was the feed they ate. Those on a grain ration had more eye trouble than those on pasture. New cases of Periodic Ophthalmia were now developing at the over all rate of 50 per thousand per year, while certain groups including the officers' mounts, which were stabled, were developing new cases at the rate of 109 per thousand per year.

Major Jones found in his 440 autopsies that the eyes and the eye tissues of horses affected with Periodic Ophthalmia all had less riboflavin than normal. He found similar conditions in the eyes of horses on a diet low in vitamin B-2 (riboflavin).

He then tried many long and interesting experiments by adding vitamin B-2 to the feed of acute cases of ophthalmia. In a preliminary trial, 20 horses with established cases were utilized. Ten of these were placed upon a high riboflavin diet and ten upon a low riboflavin diet. During the first six months there were about one-fourth as many recurrences in the high riboflavin group as in the low riboflavin group. This effect seemed significant, but as the experiment progressed, acute attacks began to appear equally in each group. As a result, Major Jones maintained that no clear-cut conclusion could be drawn. He then tried another similar experiment in March, 1944, when he started with more horses and added more, alternately, to each side as new cases developed, taking out totally blind horses. This test extended over a long period and took in a great number of horses. He began as in the former test with two groups—one had a diet enriched with riboflavin, and the diet of the other was not enriched. The difference in this test was the addition of niacin and a long list of other vitamins, added one by one to the enriched diet. Results were studied as each new vitamin was added. This most searching experiment failed to discover anything that was better than riboflavin, or as good, although its value as a treatment in established cases is doubtful.

A system of figuring what per cent of the vision was lost by each group was calculated, and the final results showed a 59 per cent loss in one group as compared to 47.6 per cent in the other group. Major Jones' report sums up the conclusion by saying, "Although the figures indicate a slightly better end result in the group receiving the enriched ration the difference is not considered significant."

The next experiment was considered "significant" even by Major Jones. In May, 1943, he took 40 horses—geldings, eight years old, and divided them into two groups of 20 each. All these horses were sound except that one in each group showed a slight suspicion of having had a previous attack in one eye. Both groups were fed well and kept fat. In his report printed in the American Journal of Veterinary Research, Major Jones shows exactly what each of the 40 horses ate each day for more than a year. One group had a ration low in vitamin B-2, and the other group had vitamin B-2 added in the form of ribo-

flavin. Then there was a third and larger group of similar horses, fed and cared for the same way by the same men, which were kept as a control group, nothing being added or taken away from their regular diet.

The first group (on a ration low in B-2) soon had 50 per cent of their eyes clouded over, and before the end of the year 9 out of the 20 were having repeated attacks and one other was totally blind. The second group (with riboflavin added) came through the year with no eye trouble at all, and the third group, on normal diet with nothing added, developed the normal rate of new cases—50 per thousand. Another experiment was made at the same time with 9 horses in each group, 3 of them yearlings, 3 two year olds, and the other 3 in each group were older. They were placed on a diet similar to the above from May 11, 1943, to July 10, 1945. The result of this test was essentially similar to the above—the ones on a diet deficient in B-2 were about 50 per cent affected, while those who had B-2 added had no attacks at all.

In November, 1943, he turned his attention to the officers' mounts, show horses, etc., which were the top group, receiving special attention and seemingly in the best of condition, but having the highest rate of new cases—109 per thousand per year. He added riboflavin to the rations of 130 of these horses and made no other changes in the feeding or management. This group of 130 horses went through the next year without a single new case of Moon Blindness, while the balance of the group continued to develop new cases at the same rate mentioned above.

Then came the largest and most conclusive test ever made with horses. The entire lot of Front Royal Remount horses, almost 2,000 head, were placed on a ration to which was added 40 milligrams of riboflavin per horse per day. This was done with group after group, stable by stable, and periodic ophthalmia abruptly stopped. This was done in 1944 and early 45. In the calendar year 1943 there had been 152 new cases of periodic ophthalmia discovered at the Front Royal Remount Depot; this rate of incidence continued in each group until it dropped abruptly a few days after the riboflavin was added, group by group, stable after stable.

Horses were now being moved but there were still about a thousand head at the remount during the following year, 1945. However, not a single new case of periodic ophthalmia developed in any group after the riboflavin was added. There were many hundred horses at Front Royal in 1946 but no new cases of ophthalmia.

Many horses were also there in 1947 and no ophthalmia was discovered; and a few horses were there in 1948 and no new cases of ophthalmia. In fact, the army has never had a new case of periodic ophthalmia since they started feeding riboflavin in 1944. What could be more conclusive proof that periodic ophthalmia can be prevented by feeding riboflavin? All of this was written by Major Jones himself in great detail as the work progressed, and published in the American Journal of Veterinary Research from 1940 to 1949.

Major Jones made another interesting experiment by testing a sample of timothy hay, then exposing it to the rain one day and drying it in the sun the next day, then gave it a second laboratory test and found it had lost two-thirds of its riboflavin. It would seem from this that feed shipped overseas might easily lose some of its vitamins, and thus account for the increase in Moon Blindness among military animals when their feed has been shipped over tropical waters.

He discovered another interesting thing in his 440 autopsies, that is, that the contents of horses' intestines often contain more riboflavin than the food they have eaten. This would seem to indicate that horses under certain conditions (probably normal conditions) manufacture riboflavin in their stomachs, probably by bacteria action. It might be that standing in the stable, or heavy feeding, or some other unnatural way of living, interferes with the normal action in the digestive tract, and thus prevents the normal manufacture of the necessary vitamin B-2.

There is a question which is often asked, and that is, can a horse inherit a tendency to contract ophthalmia? I understand in France it was generally believed that horses do inherit a tendency toward ophthalmia, or a weakness in that direction, so for breeding purposes, a horse that has had an attack of ophthalmia was looked upon with disfavor. On the other hand, I once know a German doctor from Heidelberg who, like his father before him, was an author of textbooks and a teacher in that great university. He was over here writing a technical book for the Rockefeller Foundation, and as a young man had taught riding in the Kaiser's army during the first World War. This learned doctor and able horseman urged me to breed mares that had had periodic opthalmia, contending that their foals would inherit an immunity to the disease, saying that that had been proven to be the case in Germany. Major Jones has undoubtedly made a more thorough study of this question than either the French or German authorities, and has followed the case history of the offspring of many ophthal-

mia mares, and the get of many stallions affected with ophthalmia, but his report on the subject shows no difference in the frequency of the disease. We would conclude from Major Jones' report that a horse inherits neither a tendency to nor a resistance to ophthalmia.

The Journal of the American Veterinary Medical Association (published at 600 S. Michigan Avenue, Chicago 5, Illinois), has a very interesting article by Major T. C. Jones. It has charts and references, and states that he was called to a large farm of 2,300 acres on the James River, which had 93 horses and among them he found 25 had Periodic Ophthalmia. It was developing there at the rate of 269 per thousand. He tested the riboflavin content of the feed and found the grain about normal, but the hay, which had a good physical appearance, had only 2 milligrams of riboflavin per pound, as compared with the normal average alfalfa hay of 7.7 milligrams per pound. The bedding had only 1. milligram of riboflavin per pound. One lot of 19 colts was eating the bedding, and of this lot 14 had Periodic Ophthalmia, 73.9%. Major Jones recommended that all horses be given 40 milligrams of riboflavin per horse per day, which was done by mixing it with the feed. Eighteen months later. Major Jones visited the farm again and found no new cases at all.

The riboflavin is available now in tablets of just the right size for a dose, which makes it much easier to feed.

When General Kelser was speaking at Chicago before the Horse and Mule Association of America, he was asked by Mr. Wayne Dinsmore if it was necessary to feed riboflavin to horses on pasture or on excellent green alfalfa hay, and General Kelser replied that he would if there had been ophthalmia in the vicinity. Major Jones has a survey map of ophthalmia which he prepared while at Front Royal, showing the localities where the disease is most prevalent and it corresponds almost exactly to the map showing the rainfall of the U. S. Where rainfall is heavy Periodic Ophthalmia is worse, and where rainfall is lighter ophthalmia is less frequent. This might have some connection with the fact that riboflavin is easily destroyed by water and dampness, but I am mentioning it to warn you that if you live in a good farming area with plenty of rainfall, you had better look out for Periodic Ophthalmia.

Good Pasture for Hogs

Condensed from Hog Breeder

W. N. McMillen and L. S. Pope
Michigan State College

In the past few years, many Michigan hog producers have made production records to be proud of. In most every case the proper use of pasture played an important part in their success.

High quality and abundant proteins, minerals and vitamins in growing forage make pasture or pasture substitutes valuable for all ages of swine. We did some figuring at Michigan State College on the value of an acre of just average succulent pasture. It is conservatively estimated that if you bought the drugstore Vitamin A and all of the Vitamin-B complex found in an acre of pasture, it would cost you at least $800.

To this rich store of many vitamins we must add 12 to 20% high-quality protein and an abundance of calcium, phosphorus and other minerals. The fact that pasture is so high in these body-building nutrients gives it several money-making values.

For one thing, it saves feed. By the use of succulent, green pasture, pork can be produced with at least 15% less concentrates. It also has been demonstrated many times that better hog pastures replace one-half of the protein supplement that would be needed if pigs were fed in a dry lot, or on a concrete floor.

Fattening pigs over 125 pounds may be finished at a low cost on succulent pasture, without protein supplement. The saving of protein supplement will be an important item during the next few months.

Sanitation is easier with pasture feeding than with dry-lot feeding. We usually find fewer than 2% runts developing in pasture-fed lots. It is common to find 10 to 20% unthrifty pigs when they are fed in a dry lot.

It is well known that crops used for pasture are effective in preventing soil erosion. Experimental evidence indicates that a fattening pig will scatter at least $1 worth of manure on the pasture. A sow may return $4 worth or more in a year. A large percentage of the manure from dry-lot feeding is wasted.

Properly used pastures reduce both labor and financial requirements compared with those needed in dry-lot feeding.

Pasture-fed pigs usually will

Condensed from Hog Breeder, Chicago, Illinois, February 1950

gain at least 17% faster than pigs that are receiving what is considered well-balanced rations in a dry lot, or on a concrete floor. This faster rate of gain means that pasture-fed pigs usually reach market weight two or three weeks earlier. In addition they normally bring 25 to 75 cents more per 100 pounds.

Good pasture should be a part of every summer ration. Alfalfa, clover, rape, Sudan grass and other annual pasture crops may be used. Sometimes permanent, native grass pasture may be included.

Any of these pasture crops are excellent during the period when they are producing fresh, succulent forage. A good hog-pasture program may contain any combination of the above pasture crops so long as fresh, growing feed is available from early spring until late fall. Some of the pasture crops included must be able to hold up well during dry, hot weather.

Rye or other small grain pasture has proved extremely valuable for extending the pasture season late into the fall and for furnishing early spring pasture. Experiments at the University of Illinois showed that rye pasture for sows and litters proved its worth when valued on a basis of the amount of corn and supplement saved. An acre of rye saved almost 100 bushels of corn and 560 pounds of supplement.

Even as far north as Michigan the use of early, fall-sown rye makes it possible to extend the pasture season in the fall and start grazing early in the spring.

Swine can be kept on pasture except during the heavy snow months of December, January, and February. We notice the pigs rooting the snow aside to get the rye even after the ground is covered with snow. Farther south in the central and southern part of the United States, pastures can be used practically the year round.

Hogs may be self-fed, hand-fed, or the feed may be limited on the pasture. No matter what system of pasture feeding is used, there are three essentials of good management. These essentials include the use of salt, shade or shelter, and a constant supply of fresh water.

All hog feeds should contain ½ percent salt. This means ½ pound for each 100 pounds of feed. Of course, the salt can be self-fed as a part of a mineral mixture. Usually, mineral other than salt is not required when swine are on succulent pasture.

During the summer, trees make the most desirable kind of shade. If natural shade is not available, one must devise some sort of artificial shade. It is very important that adequate shelter be provided

for hogs on pasture early in the spring. Provide housing in the fall before cold weather comes.

An automatic waterer connected to the pressure system is the best way to furnish a constant supply of fresh water. If a pressure water system is not available, use some other type of automatic waterer.

In the near future, we are going to see a system of pasture laid out near the central hog house or at least conveniently located to the farmstead. In some cases it will be possible to build swine barns with pasture on two or three sides so that the barn can be used much more than many central structures have in the past.

Having the pastures convenient to the farmstead cuts down on the labor of caring for hogs. It also lessens the investment required in piping water, hauling feed, and many other chores.

Early each year farmers should lay out their hog-production program, including a well-planned system of pasture, conveniently located. Swine producers who make such plans and follow them will be well repaid for their efforts.

Portable Pens Save Calves; Get Free Plans

Maybe this isn't true on your farm, but one calf out of five dies before it's six months old. Scours and pneumonia get many of them.

No matter what your luck with calves may be, you may want to look over outdoor portable pens, as an idea for cutting down whatever calf losses you do have. These pens are catching on, particularly in the South, and for summer time calf-raising in the North.

You can put the calf in the pen the day it's born, then move it to fresh ground every week. It's best to hang the milk pail (nipple pails are the best), water bucket, and feeder on the side of the pen, so they won't get messy.

Dairymen who use the idea keep their calves in these pens (one to a pen) for three or four months before they turn them out on fresh pasture with other calves.

If you want free plans for building the pens, write the Regional Animal Disease Research Laboratory, U.S. Bureau of Animal Industry, Auburn, Ala.

—Farm Journal

Partnership in The Woods

Condensed from American Forests

Arthur B. Meyer

BOLLINGER County, Missouri, is on the eastern rim of the Ozark Plateau. Generations of landowners have devoted their efforts to the creation of more open pasture and more cultivated fields. Yet sixty-three percent of the land area of the country is still timberland.

It is not good timber. In general the area has been overcut and high-graded and burned to a sad state of depletion. It would be easy to mark it off as too low on the economic scale to bother with. But some landowners still have faith in these cutovers—and so has the state of Missouri. As a result, a partnership has evolved that promises better days for Missouri's woodlands—and for the citizens who own and operate these woodlands.

A. E. James of Zalma, is typical of these forward-looking landowners. One-time county judge who now operates a general store in addition to his land properties, he began buying cutover woodland twenty years ago. And with the instinctive trust in the real value of land which is inherent in many men, he acquired over the years a total of 1500 acres of timberland.

Possessing no special knowledge of the business of growing trees, he simply could not accept the judgment of "worthless" commonly passed upon these forests, so he set about learning how to bring his sick acres back to health.

Mr. James now has a partner in his forest enterprise—the state of Missouri.

In 1946, about eight years after the first state forestry work was begun in the framework of a nonpolitical Conservation Commission, the legislature passed a law known as the State Forestry Act, designed to bring about better management and protection of the privately-owned timberlands of the state, which still account for over nine-tenths of Missouri's fifteen million acres of forest.

"My land," Mr. James proudly tells you, "was the first property to be certified as forest crop land under the new state forestry law."

Forest crop land means land formally recognized by the owner and the state as being devoted exclusively to the growing of timber crops, although in some cases a limited amount of grazing is permissible on large tracts.

Before certification, a forester

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representing the Conservation Commission visited Mr. James and in his company inspected the land. Together they discussed the condition of the timber, the history of abuse and neglect which had so lowered the productivity of the land, the steps taken to improve the conditions, the ways in which the state could assist the owner. They also went over the things which he would be required to do, or refrain from doing, as his share of the undertaking.

Soon thereafter the seventy-year-old Mr. James received an agreement of classification which contained provisions requiring him to make all reasonable effort to protect the lands from fire and to limit grazing to certain specified standards of maximum carrying capacity. Underlined were the basic precepts that would guide any cutting that he might make toward the maintenance of growing stock, the encouragement of reproduction and the protection of young timber.

Without attempting to write out specific minimum standards of management, the agreement required Mr. James to advise the state in writing thirty days in advance, giving the details of any plans for cutting so that assurance of compliance with sound forest practices could be made. Following any cutting, Mr. James agreed to submit a sworn statement of the quantity cut by species.

Upon the owner's acceptance of the stipulations of this agreement, the state forester issued a certificate classifying the land as forest crop land. This classification was to remain in effect for twenty-five years unless the owner voluntarily cancelled it, or unless the state, finding the owner not in compliance with basic recommendations for forest management, ended the classification.

This certificate, recorded by the proper officials as a legal instrument, placed the land on the county tax records at an assessed valuation of $1 an acre. The average valuation at which the land had been carried before was $3.15 an acre. Mr. James continues to pay taxes on the land at the prevailing county rate but upon the automatic $1 valuation. This results in a sixty percent reduction of his annual taxes. In lieu of the loss in revenue, the state pays the county two cents an acre annually.

As Mr. James had been paying county taxes on this land for a period of about twelve years, it is obvious that he did not consider taxes as necessarily prohibitive to growing timber.

"It's quite a help, however," he says. "And I can see how in many cases, where timberland is even more seriously run down than mine, the annual tax burden might be the final discouragement—added to the many other things

which a forest owner in the Ozarks must worry about."

The deferment of taxes may or may not be a major consideration to an individual owner, depending upon the circumstances involved. In either case, the intent of the law was to offer such assistance as a binding link, a cementing agent, between the owner and the state in a partnership undertaking—a tool to get sound forest management practices out into an owner's woods.

The first thing Mr. James did after classifying the land was to request the help of a technical forester in planning improvements for his woods.

A reconnaissance showed that in addition to protection, nature could be speeded along considerably in her process of rebuilding if a quantity of low-grade timber could be removed. An eighty-acre block of land was marked for stand improvement, selecting trees of poor species, poor health or condition and those crowding and holding back valuable young growth.

The forester produced no special professional secrets in his recommendations. They were common sense measures, based upon a knowledge of standing trees and of markets in the area. A brisk demand for mine props made it economically possible to salvage a quantity of badly fire-scarred young timber, selecting these here and there throughout the stand on an individual basis. Large defective black oak was marked for ties and sawlogs. A few scattered, limby white oak produced logs and barrel-stave material. The forester helped locate markets and the timber was sold standing on the stump, on a marked-tree basis. Mr. James paid to the state a yield tax based on four percent of the stumpage value of the cut.

This improvement cutting program has been continued on the property, planned now by Mr. James, but with continuing technical advice from the forester. Approximately 85,000 board feet of material have been cut. And the operation has more than paid its own way, although it is justified strictly as forest improvement. A small quantity of shortleaf pine seedlings, secured at cost from the state, have been planted in open areas suitable for their development.

The boundaries of the property are posted "FOREST CROP LAND." This, and the fact that he may request the state's help in gathering evidence for the prosecution of timber trespass, gives the owner added assurance against theft.

Mr. James, and his counterparts in every section of the state, have truly entered into a partnership undertaking with the state. Specific aids secured by their partici-

pation include forest management advice and individual, on-the-ground assistance; aid in preventing and prosecuting timber trespass; the partial deferment of annual taxes during a period of years designed to allow the accumulation of growth, building up the forest toward an eventual return to economic production.

General aids also given Mr. James, but available to any class of ownership, include publicly-financed forest fire control and tree planting stock at cost.

Building Boards and Sheets

Condensed from Capper's Farmer

Deane G. Carter
University of Illinois

MUCH of the building material you buy from now on will come in panels, rolls and sheets. Galvanized iron, wallboard and roll roofing have been used for many years. But new and rather remarkable products now provide a wide choice of "building sheets" that are sure to find a place in farm construction.

Some sheet materials replace board lumber. These are often thought of as lumber substitutes. Actually, building sheets should be chosen for their special advantages or values, and not as substitutes for lumber where it will serve best.

These materials may provide insulation in walls and ceilings, durable, weathertight covering for side walls, roofing for new or remodeled construction, sheathing over framework, cribbing for ear corn, or linings inside a building. Some sheets have limited use while others serve numerous purposes. Several may be equally good for sheathing or lining, or perhaps only one material will meet the particular need.

Farmers and builders like building sheets and boards because they are light in weight, durable, make a good appearance and are easy to apply.

The University of Illinois College of Agriculture has experimented with the better-known materials of this type to find out how practical they are for farm buildings. These materials also have been observed in use on farms and claims of manufacturers have been compared.

Last year, for example, we put up several farm buildings without

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Topeka, Kansas, February 1950

any board lumber. We tried building sheets made of metal, plywood, gypsum, paper, asphalt, asbestos, and vegetable fiber. One utility building, used principally for machine storage, is surfaced with galvanized steel sheets. A similar one has a sheathing of asphalt utility board, aluminum roofing, and enameled aluminum siding.

Other experimental construction includes: insulation board and aluminum sheets in a poultry house; insulation, plywood, hard fiberboard, gypsum and asbestos-cement for hog houses; aluminum foil insulation in several buildings; and treated paper panels in brooder houses. In crop storage buildings alone we have used the following material: (1) gypsum board for bin lining, siding and roof sheathing; (2) asbestos-cement board for bin floors and outside wall covering; (3) exterior-type plywood for panels in walls, floors and roof of a prefabricated bin; (4) plywood, covered with roll roofing for circular bin walls and roof; (5) steel sheets for all-steel bins; (6) plain and mineral-surfaced asphalt board to weatherproof wood bins; (7) wood and paper "laminate" for bin walls and roof; (8) reinforced paper to adapt corncribs for artificial drying; (9) perforated steel sheets for floors of drying bin.

Naturally the experiments have shown up both good and bad points of these building sheets. In spite of their many good qualities, they are no cure-all for the troubles we are likely to run into. Because some of the materials are quite new, too much may be expected from them. Before you make a selection, compare one material with another and study the claims made for each. Then follow the manufacturer's directions exactly in making the installation.

The best materials used in the wrong manner, or applied without following instructions, will be next to useless. A poultry expert reported that black sheets on a brooder house absorbed enough of the sun's rays on bright days to overheat the chicks. Unless the framework of a building is well constructed and braced against wind sway, most sheet materials are likely to bend, buckle, or break.

One type of building sheet, used as a lumber substitute during wartime in building movable hog houses, also proved to be a tasty substitute for mineral supplement. The hogs literally "ate themselves out of house and home." Another substitute was too brittle to stand up under the rough usage hog houses get. Still another building sheet was too soft to last more than a season or two.

Some sheet materials are excellent when put over substantial nailing strips and out of reach of animals. But they are sure to be

damaged otherwise. Fiberboard insulation will last indefinitely if kept dry, but it may go to pieces in a short time where moisture conditions are bad.

Galvanized steel sheets, so widely used on farm buildings, tend to rust after a few years. Heavier galvanizing, better application and occasional painting would add a great deal to their durability. Aluminum, in contrast to sheet iron, is a newcomer to farm construction. The farmer's satisfaction with aluminum sheets depends almost entirely on getting the right thickness, a good job of application, and protection against constant moisture or animal manure.

These troubles with building sheets only emphasize the need to know what you are buying. Find out about the qualities and values of each material. Compare one material with another. Above all, follow the manufacturer's recommendations as to uses and the instructions for applying.

Ask your dealer or supply house for instruction details and booklets. Your satisfaction depends largely on how you handle such steps as cutting, fitting, matching, fastening and finishing. Some materials must be waterproofed, others have to be protected from moisture or damage from animals, and still others must be "backed up" with solid sheathing or nailing strips.

If you observe the necessary precautions in buying and applying sheet materials, you will find the answer to many building problems on your farm. Sheets are excellent for ceilings in dairy barns and milkhouses, siding overlays on old barns and sheds, lining for grain bins, insulation and roofing.

A few new materials are on the market now and others are being developed. One recently announced sheet is made of a wood core faced on both sides with tough, treated paper. Another consists of mineral surfaced asphalt combined with fiber insulation board. You may find use for a 2-layer panel of metal and insulation fiberboard, or a 3-layer "sandwich board" that gives insulation value combined with wearing surfaces of asbestos-cement.

For common farm uses, however, the following types of building sheets are most likely to be selected: (1) asbestos-cement board, (2) asphalt utility board, (3) aluminum sheets, (4) galvanized metal sheets, (5) gypsum board, (6) hard panelboard, (7) insulation board, (8) plywood, and (9) pulpboard. Prices are somewhat lower than they were a year ago.

Here are brief descriptions of the more commonly available building sheets that will aid in selecting the best one for the purpose you have in mind:

Asbestos-cement board. A hard sheet 4 by 8 feet in size. Made of Portland cement and asbestos fibers. Usual thicknesses are ⅛-inch, 3/16-inch, ¼-inch and ⅜-inch. Used as lining, siding, overlays on old buildings and in panels. Heavier corrugated sheets are 42 inches wide and 3 to 12 feet long.

Asphalt utility board. A semi-hard sheet, ⅛-inch thick, or thicker, somewhat similar to roll roofing except heavier and more rigid. Sometimes called "backer board." Suitable for linings, sheathing layer under metal sheets, and low cost overlays on floors or walls. For very low cost repair work, a similar material with mineral surface is often used (to imitate brick or stone.)

Aluminum sheets. The most common sheets are corrugated. Length varies. Sheets are wide enough to cover a 2-foot strip with necessary lap. Thickness measured by thousandths of an inch, usually is .017 (light), .019, .024, .030 and .032 (industrial sheets). Used mainly for roofing and siding, but available in finishes, shapes and sizes suitable for many uses.

Galvanized metal sheets. Mainly used in 2-foot widths (plus lap), variable lengths, either corrugated or flat with V-crimp. Standard galvanized coating is about 1.25 ounces of zinc per square foot of sheet. Better results are obtained with 2-ounce coated sheets. Common gauges are 28 (light) to 24 (heavy) for siding and roofing.

Gypsum board. A widely used sheet 2 or 4 feet wide, made up of a gypsum plaster core, enclosed in a durable paper sheath. Standard ½-inch thickness. Used for sheathing, siding, lining, plaster lath, and decking. Heavy sheets are made at factory by gluing up 2 or more plies.

Hard panel board. Wood, cane, or other vegetable fiber processed and treated to form a hard, durable, dense sheet, usually in 4- by 8-foot size. Thicknesses ⅛-inch and 3/16-inch. Many uses, including linings, table and cabinet tops, feeders and brooders.

Insulation board. Lightweight processed fiber formed in 4- by 8-foot sheets (or other standard sizes) from ½-inch to 2 inches in thickness. Serves as wall sheathing, inside lining, plaster base, or extra insulation layer in walls and ceilings. Sometimes used as backing for brick surfaced sheets, in combination with metal, or as the core of "sandwich" boards.

Plywood. Many hardwood and softwood types are available but fir plywood is the most common. Standard sheets are 4 feet wide and 8 feet or more in length. The most common type is ¼-inch thick, made of 3 plies of wood. Additional plies provide ⅜-inch, ½-inch, ⅝-inch, and ¾-inch thicknesses. Widely used for sub-

floors, sheathing, lining, roof decking, and in movable and prefabricated structures. Use "exterior" plywood outside.

Pulpboard. The name generally applied to a number of woodpulp sheet materials. Made in 4-foot wide sheets, ¼-inch to ½-inch thick. Used principally as lining or interior wall surfaces, especially in dwelling construction. A few types of corrugated boxboard paper layers with corrugated core are suitable for farm buildings.

Rye Pasture

Condensed from Ohio Farm and Home Research

C. F. Monroe, R. G. Washburn, L. E. Thatcher
Ohio Agricultural Experiment Station

RATIONS for dairy cows are often low in carotene during the barn feeding season. Carotene, which is the plant source of vitamin A, is found chiefly in roughages. When poor quality roughages are fed, the animal's intake of this substance may be dangerously low. Even with good quality hay and silage, the amount of carotene which a cow receives is much lower than when she is allowed to obtain green feed by grazing. It is not difficult to understand this when we realize that one pound of dry matter in green, succulent grasses suitable for grazing may contain as much carotene as 10 or 20 pounds of good hay. Ordinarily in Ohio, green pasture is not available during the barn feeding season. However, by the use of some special crop such as rye, it may be possible to supply some limited grazing even during part of the barn feeding season, on days when weather and soil conditions will permit.

In order to try out this method of limited grazing as a means of supplying additional carotene during part of the barn feeding season, milking cows were turned on to a two-acre field of rye for a few hours around noon on suitable days. Two groups of 5 milking cows, consisting of 3 Jerseys and 2 Holsteins in each, were selected for this work. Both groups were fed and treated alike, with the exception that one was given access to the rye pasture as indicated above and the other group was kept strictly on barn feeding. A uniform ration of alfalfa-mixed hay, corn silage and grain was fed in the barn. The results of this

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work in respect to the supplemental carotene furnished by grazing the rye have been measured in terms of U.S.P. units of vitamin A activity per quart of milk. (U.S.P. units of vitamin A activity is a term used to express the combined values of true vitamin A and carotene (pro-vitamin A) in milk.)

The rye used in this work was sown during the middle of September 1947 and was ready for grazing the latter part of October. At this time the rye was approximately 15 inches high. The grazing habits of the cows indicated that they welcomed the opportunity to obtain some green feed, even when they were being well fed in the barn.

From October 29, when the grazing was started, until November 25, the cows were out on pasture on 21 days for a total of 95 hours. The milk from these cows at the end of this period contained 2,216 U.S.P. units of vitamin A activity as compared to 1,308 units in the milk from the group kept in the barn. During this time the pasture group had shown an increase of 33.4 percent and the wholly barn fed group had shown a decrease of 17.0 percent in respect to the vitamin A activity in the milk.

After November 25, the weather was such that the cows were out on only 10 days previous to December 22, when grazing was discontinued. During this time the cows had a total of 17 hours of grazing. Both groups showed a decline in the vitamin A activity of their milk. However, the milk from the pasture group was still 50 percent higher in these units than the milk from the group which had not received any pasture. In the milk of the former group there were 1,524 units as compared to 1,075 in that of the latter group.

On March 8, the weather and pasture were such that grazing was again resumed in a limited way. Until March 31, the cows had been out to pasture on 10 days for a total of 18 hours. The milk from these cows increased during this time from 1,209 units to 1,595 units, or a 31.9 percent increase. The other group, not out to pasture, decreased from 1,175 units to 931 units, or a decrease of 20.8 percent.

Since the two groups of cows originally selected for this work were nearing the end of their lactations, two other groups of 3 Jerseys and 3 Holsteins in each were chosen for continuing the observations. These cows had been on continuous barn feeding and their milk averaged 681 and 682 units per quart. It will be noted that these values are lower than any previously quoted. Although these were different cows than those used previously, the values illustrate the low level of vitamin

A activity in milk that may be encountered at the end of the barn feeding period. After 9 days on rye pasture, or from April 19 to April 27, the milk of the group given the privilege of pasture had more than doubled in vitamin A activity and showed 1,504 units, whereas the milk of the other group remained practically the same with 677 units. The pasture group had 41.75 hours on the rye, which furnished an abundance of grazing.

Another assay on the milk of the two groups made a week later also showed a much higher value for the milk from the pasture group than from the barn group.

One-half of the field was sown to Balbo rye and the other half to common rye. Both varieties were grazed together as one field. The cows seemed to eat one kind as well as the other. Certainly there was no marked preference apparent. The Balbo made a little more fall growth than the common rye, but this difference was not so evident the following spring.

Small areas harvested October 21 before grazing started indicated 735 pounds of dry matter per acre for the Balbo and 605 pounds for the common rye. The growth from this date until November 25 amounted to 875 pounds per acre for the Balbo and 754 pounds for the common rye.

The two varieties of rye showed about the same percentages of protein. The samples taken in the October harvests showed 34 percent on the dry basis and those in the November harvests, 24 percent protein on the same basis. In both cases the forages contained between 86 and 87 percent moisture.

In the five determinations made for carotene, the common rye was a little higher in each case than the Balbo rye. Both were excellent sources of carotene, with averages of 553 units (parts per million) for the common and 499 units for the Balbo. The values ranged between 700 units for the common in October to 385 for the Balbo rye in late November. The worth of rye for supplying carotene is more readily appreciated when we realize that it takes a good hay to contain from 20 to 30 units of this substance.

This work shows that cows can obtain extra carotene from rye pasture and thereby increase the vitamin A activity in their milk. There is good reason to believe that part of this extra carotene which the cows obtained was available for their bodily needs. Thus, the rye pasture may be credited with a health value in just the same way as good hay is credited with keeping animals healthy. One of the important values of good hay is its carotene content, which is the chief source of vitamin A for the cow. The health value of the rye pasture is

difficult to estimate. However, by means of this pasture the period of barn feeding and low carotene intake may be shortened by one or two months.

The rye pasture should also be credited with producing some additional feed. Combining the figures previously given for the fall growth of the two varieties of rye, there were produced on this field 1,480 pounds of dry matter per acre containing 28 percent protein. Estimating that the animals ate 50 percent of this and figuring the price of a 28 percent protein feed at $4.00 per hundred, gives the pasture a feed value for the fall season of $29.60 per acre. In addition to this, credit should be given for the feed which the cows obtained the following spring when harvest yields were not taken. Observations indicated that the spring growth exceeded that of the fall. In fact, the six cows used for grazing in the spring were not able to keep the field eaten down so that it became necessary to add other cows.

There are certain possible disadvantages to the use of rye pasture for this type of grazing which should be pointed out. Probably the most serious of these is the damage that will result on certain types of soil from the animals tramping the field when it is soft. On heavy soils where damage may occur, the use of rye pasture should not be encouraged. The fields may be soft too much of the time, especially in the spring of the year, to permit much grazing and the pasture would get too rank for good eating.

Another possible disadvantage may arise from the irregularity in the feeding and management of the cows caused by turning them out to graze on some days and not on others. This should cause no serious difficulty if the cows are kept well fed in the barn and if the grazing is limited to only a few hours. According to the method of management as used in this work, there appeared to be no unfavorable effects on the cows from grazing the pastures. In fact, the cows seemed to like the opportunity to get some green feed. They would start grazing almost at the gate when turned out.

Where it is practical to graze rye in the late fall and early spring, consideration should be given to this method as an economical means of supplying some extra carotene to the diet of milking cows.

What's New in Dairy Cattle Feeding?

Condensed from The Rural New-Yorker

H. A. Keener

Some of the most interesting discoveries in the field of dairy cattle feeding during the last few years have had to do with the rumen or paunch. It is this organ which makes it possible for the cow to eat large amounts of hay, pasture and silage, and turn them into the highest quality food more efficiently than any other farm animal. The fermentation in the rumen breaks down cellulose and other fibrous materials so that they can be used as an important source of energy by the body. The bacteria in the rumen build simple nitrogenous compounds in the feed, as well as materials such as urea, into high quality protein which can be digested and used for growth, muscle repair and milk production. Finally, these bacteria synthesize the various B complex vitamins which the animal needs. Because of this, deficiencies of any of the B complex vitamins in cattle are almost unknown. Although this much has been known for quite a few years, recent research is beginning to tell us how to feed these bacteria so that the greatest benefit can be realized from their activity in the rumen.

Work carried out at the University of New Hampshire will serve as an example of this. When the relative feeding value of a mixed forage made into silage without preservative, as well as mow cured and field cured hay, was determined by means of digestion balances with heifers, both the protein and energy in the silage were found much less digestible than in either of the hays. This was true in spite of the fact that the silage was higher in total content for both protein and energy than either hay. In these experiments each roughage was fed as the sole ration. However, when these same roughages were fed along with two pounds of grain per day to other heifers in the feeding experiment, the heifers which received the silage gained about 50 per cent more in weight than did those which received either hay. This was in spite of a lower digestible nutrient intake as calculated from the results of the digestion experiments.

These results appeared rather contradictory at first. However, after some study an explanation

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333 W. 30th St., New York City, New York

appears possible. Since the silage was put into the silo without preservative, a large part of its readily available carbohydrates was used to form acid. When this silage was fed, it should have gone through another normal fermentation in the rumen. It is possible, though, that enough available carbohydrates may not have been left in the silage so that the bacteria in the rumen could do their job properly; or stated another way, the acidity of the silage may have been too high to permit a normal fermentation. Under such a condition the addition of grain may have influenced the available nutrients enough to permit greater digestibility of the silage.

Another as yet unexplained finding reported recently from Michigan may also be clarified when more is known about what goes on in the rumen. It was found that when part of an alfalfa hay ration being fed to milking cows was replaced with an equal amount of total digestible nutrients from corn, there was a considerable increase in milk production. A stimulating effect also was obtained from corn silage containing added grain, and to a lesser extent from early-cut grass hay, but without change in total nutrients. This discovery may be found to have a lot of practical value for some grain feeding when contrasted to an all roughage ration.

Interesting new developments have been recorded on the relationship between the function of cobalt in ruminant nutrition, the synthesis of vitamin B12, and activity of the rumen flora. About a year and a half ago chemists in the Merck research laboratories reported the isolation of vitamin B12 and stated that cobalt was a part of the molecule. Since this vitamin is found in rather large amounts in liver, milk, fish products and similar materials, it is commonly associated with the animal protein factor (APF). Actually, vitamin B12 is only one fraction of the animal protein factor. This vitamin produces remarkable results with pigs and chickens and may have some value with young calves. However, there is no information which would indicate that there is any advantage from supplying it for older dairy cattle under normal conditions.

When vitamin B12 was found to contain cobalt, it was thought that it might be a contributing factor involved in cobalt deficiency. It is known that vitamin B12 is synthesized in large amounts in the digestive tract of ruminants and that the amount of cobalt in the diet affects the rate of synthesis. However, as far as known, no one as yet has been able to relieve cobalt deficiency with vitamin B12.

Studies on thyroprotein feeding

have been reported quite often during the past few years. Thyroxin, the hormone produced by the thyroid gland, controls the rate of metabolism in the body. When thyroxin production is too great, body activity is stimulated and food reserves, particularly fat, are burned up, thus making the body lose weight. When thyroxin production is too low, body activity is not stimulated enough and fat deposits become excessive. Thyroxin is expensive to recover from slaughtered animals and very scarce. It was discovered several years ago that a potent synthetic thyroxin could be made by treating certain proteins with iodine under proper conditions. Consequently it is now possible to stimulate the metabolic functions of the cow with this product (thyroprotein) at low cost and thereby to increase the production of her milk. A year or so ago the sale of thyroprotein was permitted by the Federal Food and Drug authorities and a limited number of dairy rations containing it are on the market. However, feed manufacturers seem to be reluctant in putting out such a feed because they cannot control its use.

Thyroprotein has been found to give the greatest stimulus to milk production just after the natural stimulus begins to wear off. Because this effect is much greater in high producing cows than in low producing ones, it does not have the desired effect of making high producing cows out of low producing ones. It necessitates a liberal increase in feed consumption to take care of the increased production as well as the increased heat produced by the body; otherwise, a marked loss in body weight would soon occur.

The use of thyroprotein puts an extra strain on milking cows during hot weather since it adds to the already heavy burden of heat elimination. The question of thyroprotein feeding is causing extension men and breed association officials quite a lot of concern because of its possible effect on their production testing programs. It is practically impossible to determine if the product has been fed. There are no known harmful effects from consuming milk from cows which have eaten it. It appears that such a product may have a place in the feeding of certain commercial herds where a cow is sold as soon as her production drops to where she is unprofitable, but it would seem that the dairyman who is carrying on a constructive breeding program would be better off to depend on excellence of individuality plus good feeding and management.

Some new work has been reported recently on the role of vitamin E in dairy cattle feeding. For several years wheat germ oil was advertised widely as a preventive or cure for sterility. As

yet no conclusive evidence has been produced to prove its value for this purpose. A recent report from Minnesota substantiates this by stating that when dairy cattle were fed a vitamin E poor ration for three generations, reproduction was not affected adversely. However, 13 of the 28 animals on the low vitamin E ration for more than a year died suddenly at ages ranging from 21 months to five years. This appeared to be due to a heart injury. Thus it appears that, as far as dairy cattle are concerned, vitamin E may be more important for normal muscle activity than for normal reproduction.

Other recent claims have stated that the feeding of tocopherols (vitamin E) would increase milk production, fat percentage and fat production. Experiment station workers have not found this to be true either. Even where vitamin E poor rations were fed in the Minnesota experiment, growth, milk production and fat production were not affected.

There is another development with respect to vitamin E which does appear to have some practical significance. This has to do with the stability of milk to oxidized flavor. Preliminary reports on work done at Cornell show that milk produced by cows receiving tocopherol supplements was less susceptible to oxidized flavor than milk from cows not receiving it. It also increased the tocopherol content of the milk.

The problem of how to cut the heavy loss of calves in early life, and how to grow stronger and healthier herd replacements, has received a lot of attention during the past few years. Vitamin preparations have been advertised widely as the answer to this problem, but practically all experimental work on this matter has given negative results. Colostrum, nature's answer to this problem, still appears to be the best solution because of its high natural content of vitamins, minerals, protein, antibodies and energy. Calves are usually born almost devoid of carotene and vitamin A, but because of the very high carotene and vitamin A content of colostrum, it gives the calf large amounts of these materials very soon after birth. In order to take full advantage of colostrum, calves should receive it for at least three days.

In spite of its great value, large quantities of colostrum are wasted on farms in this country. Workers at the Vermont Station have recommended the freezing of excess colostrum, thus saving it until needed by some weak or valuable calf. More recently, workers at the Ohio Station have reported excellent results from feeding excess colostrum to other calves. Calves were changed abruptly from normal milk to colostrum

when it was available without harmful effects. The calves which received the surplus colostrum made more rapid gains, had higher blood levels of carotene and vitamin A, and presented in general a healthier appearance than the control calves. This finding should be adopted widely.

Work reported recently from Cornell has shown that the stores of vitamin A in the body of the calf at birth can be increased by feeding large vitamin A supplements to the cow for a few weeks before calving. This also influenced the amount of carotene and vitamin A in the colostrum. Work at Connecticut showed that calves from cows which had received supplemental vitamin A before calving made greater gains and had less scours than calves from cows fed a fitting ration. Because of the rather high cost of feeding large amounts of commercial vitamin A to cows during the dry period, the practical value of this practice is questioned. On the other hand, the adequate use of good quality roughage and forage is the cheapest and best natural source of vitamin A, and they should be liberally fed.

Another interesting report from the Ohio Station tells of the good results obtained from inoculating the rumen of the young calf with pieces of cud taken from a cow. This treatment is carried out for the purpose of setting up the proper flora in the calf at an early age so that it can best use the hay and grain it consumes without digestive upsets. It was found to help prevent an unthrifty, stunted condition from developing when administered to a newborn calf. Several such inoculations were given each calf. This treatment was found to be particularly beneficial to calves kept separate from their dams. Another interesting observation from this work was that, under normal conditions, the characteristic desirable microorganisms became very scarce and sometimes disappeared when too much grain was eaten by the calves. The favorable bacteria multiplied readily in the presence of a high proportion of good quality roughage. Attacks of scours were rather frequent during the first few weeks of age in those calves which received grain, but were almost entirely absent in those which received milk and hay alone.

Continued progress is being made in learning how better to feed dairy cattle and calves, but because of the complicated nature of the animal body, such research takes time and repeated testing before definite conclusions can be drawn.

Transforming Waste Products Into Cash

Condensed from Canadian Poultry Review

THEY make the feathers fly at Feather Industries Limited. Poultry feathers, once a nuisance on the farm and at dressing plants, are being processed and graded to become a commodity of real commercial importance.

Nearly worth their weight in gold are the hackle feathers of chickens, which range from $1.00 a pound for mixed white, columbian and red, to double this amount for all-white hackle feathers. In between, at $1.75 a pound come Barred Rock neck feathers of the same type.

All feathers are not of value in this industry. Main wing and tail feathers are not wanted at all, so that this means sorting definitely is necessary. Then also, chicken feathers and the feathers of all turkeys excluding White Hollands, are worth but 5 cents a pound on the market at present. White turkey body feathers, however, are now worth about 25 cents a pound. All feathers should be delivered in jute or cotton feed bags and only new feathers are acceptable. If wet-plucking has been employed the feathers are not wanted, unless the shipper has employed a feather-washing unit of an acceptable type. These last are costly and cumbersome to handle, so that in small or even medium-scale operation, dry-plucking is necessary if feather values are to be realized.

This applies to duck and goose feathers also, but these are the really valuable commodity, with duck body feathers varying from 60 to 80 cents and those of geese (less wing and tail, of course) ranging from $1.00 to $1.25 a pound. All such prices are for clean feathers and dry weight, and it should be stressed that supply and demand in the processed feather business are quite variable, so that these prices might range up or down within a week or two.

Showing the wide ramifications of the feather market was the fact that while the Review representative was visiting the offices of Feather Industries Limited, there were telephone conversations carried on with feather merchants in China, and buyers of the finished product in London, England, within a period of less than half an hour. About 90% of the raw product has come from China in the past. This comprises bales of tightly packed duck feathers weighing from 420 to 480 pounds per bale, and yet the bulk is not equivalent to the size of a bale of

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Toronto, Canada, December 1949

hay. Nearly all the Chinese feathers are from colored ducks. China can supply copious quantities of these, but—strange to relate—neither goose nor white duck feathers are offered.

The plant is large and covers a great deal of ground. This stems in part from the fact that large washers, dryers, mechanical sorters and other equipment are necessary; also, that in some stages of processing the feathers and down are loosely stored in large rooms awaiting bagging by a vacuum-suction process.

All feathers arriving at the plant, which is not far from Toronto's Don River, are washed. They are dumped into a drum which will handle up to 150 pounds of dry feathers at a time. A special type of soap is used with hot water. The washed feathers are then fed by gravity into a centrifuge dryer, which operates on the spin-dry principle, much like the latest clothes-washing machines, thence to a steam heated dryer, and then they are blown along large tin ducts to the cool room. Other feathers are drawn into large shipping bags by suction.

Sorting is the next step, and this ingenious grading method was so well described in the Board of Trade Journal of Toronto, that we quote a portion of the article as follows:

"Air is swiftly circulated in vertical chambers having a hinged door on each compartment. The lighter feathers gradually get to the top compartment and those less buoyant are automatically classified in a similar way according to size and weight. Control of the air volume in each compartment permits accurate grading from the heaviest feathers—used in millinery and sporting specialties—through lighter feathers for cheaper grade bedding, and then the half-down, half-feather composition of better quality pillows. The much prized down settles in the last compartment, drifting from the barely opened door like fine snow. Suction exhaust pipes draw the feathers from each compartment to bags for shipping.

"The chief argument supporting the extensive—and expensive—processing is economic. Processed feathers cost more than casually cleaned ones. But processed feathers weigh only one-sixth as much as an equal volume of untreated material. Feathers are sold by weight, so that the manufacturer of bedding is more and more accepting the advantage of processing. For the American market, with its multiplicity of State and Federal regulations, processing feathers is obligatory.

Head of the firm, and the man who developed this unique feather processing method, is Hanus J. Heller. Mr. Heller, a Czechoslovakian by birth, gained a wide knowledge of feather processing in

Europe, where feathers are used much more extensively than in the New World.

The sorting gives three distinct end-products: feathers, half down and down. Among the multiple uses of these products are their purchase for bedding, pillows, comforters, sleeping bags and upholstered furniture. Their use for lures for fishing tackle applies to hackle feathers only, while there is a limited market for feathers for millinery and other ornamental purposes, badminton birds, arrows for archery.

One unique feature of the processing is the breaking down and "curling" of the coarser body feathers of chickens and turkeys. This makes them more fluffy, and increases their intrinsic value, but it by no means raises them to the grade of down, nor of half-down.

It is interesting to see a waste by-product such as this become useful. In times of scarcity of eggs and poultry meat, with top-grade eggs often near 50 cents a dozen to producers, and chicken and fowl, of the same category, seldom below 45 or 40 cents a pound, feathers might not be deemed worth salvaging. However, when prices come closer to the costs of production—farmers and commercial poultrymen may turn to feathers, or any by-product of value, and find their salvage interesting and lucrative.

Wheat and Timothy Go Well Together

Ever thought about growing a little grass right along with each crop of wheat, instead of taking time out to raise one big green manure crop?

The Jacklin Brothers are doing it on their farm in Spokane County, Wash. They like the results, and think it may work with other grains in other parts of the country.

Before drilling winter wheat in the fall of 1946, they broadcast 6 pounds of timothy and 100 pounds of ammonium sulfate per acre on disked pea ground.

The timothy came on early the following spring, and was almost 4 inches high before the wheat took over. The fertilizer more than offset the competition offered by the timothy, however, and the wheat went on to average 50 bushels per acre.

After harvest, the timothy started growing again, and was about 6 inches tall when the field was plowed in November.

—Farm Journal

Cattle Production in Cuba

Condensed from Brahman Breeder-Feeder

Milton Galvez

CUBA'S greatest resource is the fertility of its soil. That is what it has marketed for centuries, and for years to come its prosperity will depend primarily on the return that is realizable from this source.

In the proportion of its land that is sufficiently level for agricultural development, in the great depth and fertility of its soil, in the general adequacy of its rainfall, and in its relative freedom (for a semi-tropical area) from insect pests, Cuba is one of the fortunate countries of the world. It has an abundance of fertile soil, an adequate labor supply, plenty of capital for expansion needs, and a relatively comfortable exchange position. Although it has a population density (108 persons per square mile) greater than that of any Latin American republic except El Salvador, Haiti and Puerto Rico, its land area is far from being completely used, let alone strained.

Most tropical and semi-tropical agricultural countries are plagued by the lack of adequate transport. The great cost of highway and railway development is a major deterrent to agricultural and industrial development. In this respect Cuba is phenomenally well off. Its railway network consists of almost 3,300 miles of line operated for public service, giving Cuba about the same number of miles of railway per square mile of area as has the continental United States. In addition, Cuba has over 2,700 miles of railway operated by the sugar companies primarily for their own industrial purposes, but commonly used also for hauling general merchandise for villages in the cane districts.

Cuba, at the beginning of 1945, had 2,140 miles of paved highway, and 255 miles of improved highway. Since then, there has been some addition to all-weather mileage, and a considerable amount of badly needed maintenance work on the paved road already in existence. Nevertheless, except for the linking of the main cities, there is a notable lack of access highways that will support traffic in the wet season.

Although Cuba is by far the world's leading sugar exporter, other segments of her agriculture clearly have not been ignored,

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Houston, Texas, August 1949

however much they may have been neglected. There has been an encouraging trend toward diversification of agricultural effort, particularly in the past twenty years, following the adoption of a definite policy toward that end in 1927.

Meat production in Cuba is the second largest agricultural activity, measured by the value of product. Some hogs are raised, and a few sheep and goats, but beef and veal account for at least 85% of the meat output. There are perhaps 850,000 hogs in Cuba, but there is little that could be termed hog culture, most small farms maintaining a few hogs that are allowed to forage for themselves. Because of the lack of feed availability, Cuban hogs mature slowly, are relatively light and lean, and produce little lard. Cuba normally is about self-sufficient in pork production, but imports four-fifths of its lard requirements.

The following table, prepared by the U. S. Tariff Commission, shows that Cuba is relatively a very large consumer of beef.

Product	Per capita consumption in 1940	
	Cuba pounds	United States pounds
Beef & Veal	70.0	62.5
Pork	10.0	72.9
Mutton, Lamb & Goat Meat	1.00	6.6
Total	81.00	142.0

Up to the late 1920's, Cuba was a large importer and negligible producer of meats. From 1921–25 her meat imports, principally jerked beef and salt pork averaged 103 million pounds per year, lard 95 million pounds, and canned milk 45 million pounds. In 1948, with a much larger domestic consumption, the import of beef was calculated to be 2 million pounds, of pork 6 million pounds, of lard 70 million pounds, and of canned milk 23 million pounds. Thus, in 1948 Cuba was far better fed in these items with approximately 40% of the import volume that was available in the earlier period. Her beef consumption in 1948 was calculated to approximate 100 pounds per capita.

Most Cuban grazing is concentrated in the level areas of Santa Clara, Camaguey and Oriente. Feed is almost universally restricted to range grass, principally parana and guinea, which thrives best from May through December, but sustains cattle all year round, although in the driest periods the cattle merely hold their attained weights. Some good work has been done in improving stock types through the general intermixture of Zebu, and more recently Santa Gertrudis and other strains.

The beef produced is lean, without marbling and without fat. This leanness, and the high water content of the meat due to a low-protein diet makes it handle badly under refrigeration. Since freshly slaughtered, lean beef is said to accord with the Cuban taste, and

the domestic market offers no premium for better grades, there has been little incentive for improving basic stock, or feeding and handling practice. Furthermore, government controls have held meat prices to a disproportionately low level, which has served to drive much of the slaughter out of reputable and efficient packing channels and into the black market.

The cattle population of Cuba is variously estimated at from 5 to 6 millions, and the annual slaughter at perhaps 750,000. There seems to be ample evidence that Cuba's pasture lands could support substantially more cattle, and that with proper breeding, feeding and care, they could produce larger quantities of meat of higher than the current "utility" grade.

Milk products came fourth in value in the list of 1946–47 agricultural production. Except for the Habana area and areas near one or two other cities, milk is produced from the low yield (3 to 6 quarts per day) beef herds which are entirely pasture fed. Again, except in a few of the major cities, there is little consumption of fresh milk, almost all the milk production being processed into condensed or evaporated milk, cheese, or butter.

In the 1920's Cuba imported 45 to 50 million pounds of canned milk annually. By 1940 she had attained a state of self-sufficiency, but in the past three or four years droughts, disputes over cattle price controls, and particularly the increased consumer purchasing power has made Cuba a net importer again, at a scale almost half that of the 1920's. Peak production of dairy products in Cuba was achieved in 1941, and after a few bad interim years it has been gradually building back again toward earlier levels.

As with the case of beef, further development of dairying depends upon improved breeding stock, and especially upon supplemental feeding. It may be a long while before Cuba becomes a large consumer of fresh milk, but there is no good reason why she should not be self supporting again in her canned milk supply.

Debeaking Day-Old Chicks

Condensed from California Farmer

Emery A. Johnson

DEBEAKING growing stock and laying pullets is a common practice among many poultrymen. Usually, such debeaking is accomplished at four or five weeks of age, or immediately prior to the introduction of the young pullets to their permanent production quarters.

The debeaking of day old chicks is drawing increased attention from poultrymen, especially from fryer producers who want to develop well-feathered birds with minimum feed wastage. These fryermen are now purchasing debeaked day-old chicks direct from their chick sources at an added cost of approximately 1 cent per chick.

At the time the chicks are boxed for delivery, the upper mandible is removed by cutting with a toenail clipper. The amputation is made just in front of the nostrils, and well into the quick or beak-forming tissues. Generally only one drop of blood is shed, which the chick immediately swallows. No apparent shock is observed and the chicks in most instances are eager to eat and drink upon their arrival at the ranch.

Upon occasion, however, the debeaking has discouraged some chicks from learning to eat or drink, with a resulting 2 to 3 per cent mortality at three to five days of age. Upon rare occasions, the early mortality has been somewhat higher.

Despite these possible light losses, most fryermen who have purchased debeaked-day-old chicks report very satisfactory results. The debeaked chicks are unable to pick over the feed and the billing-out of the mash from the hopper is reduced to a minimum. One fryerman reports a saving of one sack of mash every three weeks on a 1000-chicks-every-two-weeks basis. Brooder hoppers can be filled, preventing the chicks from getting into the hoppers where they may become entrapped and chilled or picked.

Not only does early debeaking result in the efficient use of feed, but also prevents all feather-pulling and cannibalism. Barebacks do not occur among growing birds which have been debeaked at hatching, according to fryermen who have raised them. Fighting among the developing fryers is

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Los Angeles, California, January 28, 1950

practically eliminated and the males, especially, are more quiet than normal birds.

If the debeaking has been as severe as indicated, the upper beak of the chick will not develop. In pullets retained for egg production, the lower mandible will consequently grow to abnormal length as the bird matures. It will be necessary to trim the lower beak from time to time.

Better Weed Killers to Come

Condensed from Nebraska Farmer

Weed experts are still directing their research toward better and specific weed killers. They have as their goal "A" chemical to be used on "B" crop on "Z" weed.

That was the consensus of the agronomists attending the North Central Weed Control Conference last December at Sioux Falls, South Dakota.

Weed experts from 13 states and four Canadian provinces reported on weed investigations made during the year 1949.

The weed specialists were quick to point out that present chemicals were not the only answer to a sound weed control program. The agronomists emphasized the importance of good farming practices, good rotations, weed-free seedbeds, use of weed-free seed, and recommended crop varieties. Chemical weed killers should be used on weedy crops when it is the best and most economical way to control weeds.

The herbicide 2,4-D is still the sweetheart of the weed killers. There are several new formulations of 2,4-D now being tested which show promise.

There are other chemicals as PCP; TCA; and 2,4,5-T which need more testing before release for general use. But they do have fine prospects.

PCP (pentachlorophenol) compounds which appear promising for use in weedy soybeans are not as good as some of the dinitro sprays; TCA (trichloroacetic acid) as an aid to plowing or cultivating quack and other grasses appears good; 2,4,5-T, a specific killer for use alone or with 2,4-D in controlling many species of woody plants and brush have been used effectively.

More than 15 million acres were treated with chemicals in the 13 north-central states last year. 2,4-D was the chief chemical used

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Lincoln, Nebraska, January 7, 1950

in the selective weed control used in crops and pasture.

Research presented showed that pre-emergence treatment of corn is not a substitute for cultivation. Effective pre-emergence treatment of corn with chemicals is dependent upon a number of factors, particularly moisture and the time of germination of weed seeds. Pre-emergence treatments of corn with 2,4-D are not recommended on sandy soils, acid soils, or soils of low fertility.

The pre-emergence treatments should usually be applied five to seven days after planting. Research men said that one and one-half to two pounds of 2,4-D per acre will give good weed control with a minimum reduction of corn yields.

Weather greatly affects corn's resistance to 2,4-D. So does its size. Baby corn plants—less than 10 inches high—appear to be tougher than corn in the 10 to 36 inch high stages.

The experts changed their thinking on a number of ideas. Three years ago it was considered dangerous to spray flax with 2,4-D. Several varieties are now being sprayed.

The agronomists said that 2,4-D should not be used on alfalfa and sweetclover. They recommended the dinitro sprays if broad-leaved weeds threaten fields.

Several different ideas were advanced that could save both time and money. Spraying for both weeds and insects at the same time. You might be able to combine a final cultivation, 2,4-D spraying, and insect control like DDT for corn borers. You may possibly also spray, fertilize, and plant simultaneously.

Wrap Apples in Oiled Newspapers

Some apples, you've probably found from experience, are poor keepers. But here's a way to make even the short-lived varieties keep well into winter.

Spray old newspapers with mineral oil (you can get it at any drug store), and wrap each apple separately in some of the oiled paper.

The oil absorbs some of the gases released by the apple as it ages, and prolongs the life of the fruit. Store your apples in a cool place—just above freezing if you can.

—Farm Journal

New Idea In Bull Housing

Condensed from The Ohio Farmer

George A. Chapman

SOMETHING new in housing bulls! That's the story at the Central Ohio Breeders Association near Columbus. There, for the past couple of months, 22 of the association bulls have been housed in a new building unlike any other in the country. In fact, it was designed by the employees to house the bulls in comfort and safety.

The new barn is a simple shed structure, open on the south side. Paddocks extend from the open side for a distance of about 70 feet. Walls of the paddocks are made of cement blocks. A feed alley and manger extend along the full length of the building and across the end of each paddock. There are five of these paddocks and several bulls run loose in each. The paddocks are from 20 to 40 feet wide.

The number of bulls in each paddock depends upon the breed and "personality" of the animals. At present six Holstein bulls are housed in the 40-foot paddock. Gene Lemmerman, assistant manager, says: "This is the first group of bulls turned into the new barn, so we aren't quite certain just how many we can successfully put into the individual paddocks. As far as we know this is the only barn of its type in the United States so we will have to figure everything out for ourselves."

Each bull carries a three-foot chain which can be used to tie him up when necessary. The bulls are chained while the paddock is being cleaned as one of the many safety practices in use on this farm.

Entrance to the paddocks for cleaning purposes is through solid gates at the end of each paddock. The spreader and tractor can be pulled into the paddock and the black-top floor makes it easy to use a manure loader.

Another interesting feature of this barn is an electrically-heated drinking cup in each paddock. Each cup is set against the wall and surrounded by a cement base to prevent them being knocked over by "playful bulls."

The shed is open on the south to insure maximum sunlight and minimum chilling effect of north winds. The five-foot high cement block walls will stop most winter winds from the other directions.

Reprinted by permission from The Ohio Farmer
Cleveland, Ohio, January 21, 1950

Pelletized Dairy Products for Poultry

Condensed from New England Homestead

John Willoughby

DAIRY products are excellent for poultry, but do you get any extra profit back in return for the extra feed cost?

That was the question behind an interesting series of feeding tests conducted by a group of New England poultrymen, a state agricultural college and a county vocational agricultural school during the past laying season.

Nearly 3,000 birds, Rhode Island Reds, New Hampshires, Barred Rocks and a Barred Cross, all from New England's high-producing flocks, were used in the tests. In each case, whether on the farm or at the schools, the normal laying ration used was fed to control flocks. Test flocks received the same rations with the addition of milk products. For instance, the state college used its Barred Rocks and an approved College laying ration, the county school used its own formula ration. The dairy products were fed in a new and convenient pelletized form, and were simply added to rations fed test flocks. Test and control flocks in each case were of the same age and breeding, and received identical care and management. Accurate feed cost and egg production records were kept. Tests ran an average of 164 days. For purposes of making profit comparisons 55 cents per dozen was used as an average price for eggs.

Results show an average extra profit of 26 cents per hen for the test flocks, after paying for extra feed costs. These results announced by Kraft Foods Company which cooperated in the tests, show that the addition of the milk product boosted egg production an average of 8% and increased profits an average of 12.3%.

Average egg production for test flocks in all tests reported was 64% compared to 59% for control flocks. Average feed cost per dozen was cut one cent, from 29 to 28 cents, by the test flocks, and culls and deaths in the test flock averaged 15% against 17% in control flocks.

Highest extra profit per hen, 40 cents, was reported by Joseph Pelletier, Glendale Poultry Farms, Somerset, Mass. Pelletier, who raises as many as 15,000 Rhode Island Reds a year, ran the test

Reprinted by permission from New England Homestead
Springfield, Mass., September 24, 1949

for 182 days and reported a net income (eggs over feed) of $2.71 per hen in his test flock compared to $2.31 per hen in the control flock. His test flock laid 7% more eggs and had 8% less deaths and culls. Average production for the test flock was 71% compared to 66% for the control flock. Pelletier had 250 hens in his test flock and explains that he figures he would have made $174 more per month had he fed the dairy product to his entire laying flock.

The county school, with Barred Rocks and its own formula laying mash, attained highest production and realized the largest net income per bird. There the test flock birds made a net income of $3.06 each compared to $2.71 each for control birds. Average egg production was 74.4% for test flock, 69% for control flock. Extra gross profit was 35 cents per bird and feed cost per dozen eggs was 25 cents per dozen for test flock, 26 for controls.

August Bruyneel of North Weare, N. H., winner of the Storrs laying test in 1944 and president of the New Hampshire R.O.P. Association, conducted another test. He used R.O.P. New Hampshires and fed a nationally-known breeder mash free choice, plus scratch grain and breeder pellets in limited amounts as his basic or control ration. Bruyneel had an average production of 67% in his test flock, 59.5% in his control flock. He had 13% more eggs from the test flock and made 33 cents extra profit from birds in that flock.

At the state college Barred Rocks were used for the test and the basic ration was the New England College Conference laying ration fed free choice, plus limited amounts of scratch daily. Here the test flock laid 7% more eggs and made 6% more profit, or 15 cents more per bird in a 167-day test. Egg production average 68.5% for the test flock, 64% for the control flock. The college also kept records on fertility and hatchability of eggs, and reported 97.4% fertility and 85.8% hatchability for eggs from the test flock, compared to 95.6% fertility and 81.6% hatchability with eggs from the control flock.

A Second Look At Radiant Heating

Condensed from Poultry Tribune

L. M. Hurd
Cornell University

LAST spring I visited 10 poultry farms in New York State, Pennsylvania and Vermont that are using radiant floor heat for brooding chickens and turkey poults.

I was particularly interested in visiting some of the oldest installations to find out how they felt about radiant heat after several years' use. *In all cases, whether the installations were old or new, the operators were enthusiastic about this method of supplying heat for brooding.*

All of them, when asked, "Would you put in radiant heat again if you were replacing your equipment?" replied that they would.

Some said they might make changes that would improve its operation and reduce the cost of installation, based on their experiences. Christo B. Tsantis, one of the first broiler growers to make a radiant heat installation, mentioned the fact that it had saved them substantial sums of money for litter, fuel, and labor during the past 4½ years.

New installations of radiant heat are being made constantly in the broiler growing area of Long Island. The most recent one is a new two-story house, 100 × 56 feet, by one of the older broiler growers. This house will have automatic waterers, feeders and window ventilation.

Another old-time broiler grower, who has been very successful over the years, said he was planning to convert some of his houses that now have hot water systems with pipes above the floor over to radiant heat.

I believe the favorable results that these experiencd men have had in an area where many systems of brooding are in effect is a pretty good indication of the way experienced poultrymen feel about the use of radiant heat in brooding chickens. It is probably true that the cost of installing radiant heat is a little more than for some other ways of providing heat in brooding chicks, but apparently these experienced men feel that the gains in labor-saving cost of operation and litter are worth the increased investment.

I made a particular point when visiting the various plants to check on the temperature and humidity

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Mt. Morris, Illinois, July-August 1949

conditions. This was done because there has been some criticism from certain quarters about too little humidity with radiant heat.

I did not find a single instance where the operator reported this, but I did find on a few of the farms that there was a tendency to run the starting temperature for chicks a little higher than is necessary. I think the reason for this is the fact that the operator probably did not fully understand the difference between radiant heat and heat supplied by conduction.

By ordinary methods, such as a stove, the air is heated in one central spot and then distributed throughout the room by currents of air. In radiant heating, on the other hand, one entire surface of the room, generally the floor, is a low temperature heating panel.

When the floor has been heated to the desired temperature, the heat radiates throughout the room in waves without affecting the air mechanically. Radiant heat establishes comfort for the chicks by making up through radiation for the excess loss of body heat to the surrounding cooler air.

Experience has shown that day-old chicks will be comfortable at a temperature from five to seven degrees lower than is customarily maintained under a coal brooder stove, or like equipment. Where temperatures of 88 or 90 degrees F. or higher are maintained in the beginning in the area where the chickens are on the floor, there is a tendency for the floor to become quite dry and dusty during the first two or three weeks. Most operators have found 82 to 83 degrees F. to be comfortable for the chicks. Such temperatures result in better floor conditions.

It was my observation that the biggest problem confronting the chick grower using radiant heat was an adequate system of ventilation. I found several different methods in use. Two or three operators were using fans; one was using a flue, but most of the operators used the windows, making variations according to weather conditions.

From the limited number of observations made, it would seem that fan ventilation has much to commend it in brooder houses. It is my guess that the amount of air passing through a pen should depend upon the pounds of livestock in the pen. This, of course, will vary constantly with the age of growing birds. This means that the volume of air removed needs to be varied. This usually can be done by using multi-speed fans or more than one fan unit controlled either manually or by thermostat. This allows the ventilation to be controlled according to the weight of the birds.

In laying house ventilation, when fans are used, the Cornell

Agricultural Engineering Department suggests a change of air at the rate of two cubic feet per minute of each five pounds weight. This air delivery suggests a possible basis for calculating the maximum when the birds are full grown.

Most of the older installations of radiant heat were made with iron pipe, but some of the newer installations are being made with copper tubing, and smaller sizes are used. With smaller pipe, a thinner and less expensive slab of concrete can be used. Recent data indicate that tube diameter is a minor factor in heat emission and that tube spacing is the main criterion.

If properly laid out, the copper installations have proved to be just as efficient as the iron pipe. Copper tubing is much easier to handle, particularly when the smaller sizes are used, and, although it may cost quite a bit more than the iron pipe, the grids can be made faster and easier than with iron pipe.

Then, too, with copper tubing there is a better opportunity to use ceiling heat instead of floor heating. Ceiling heat was used last winter in two 12 × 12 foot brooder houses on the Cornell Experimental Farm. Three-eighths inch copper tubing was fastened to the rafters of the building, spaced about 6 inches from center to center, covered with metal lath, and then plastered so that the tubing was surrounded with the plaster. In this case the panel of plaster acted as a radiating surface. No trouble was experienced in securing proper heat on the floor.

With ceiling heat, adequate insulation above the panel is important. The panel can be set up relatively easily, and if anything happens to the coils it is not too difficult to get at them. Adequate ventilation was found to be as important with ceiling heat as with floor heat.

Another method of installing radiant heat has been reported by the General Electric Company in Ohio where soil heating cable has been imbedded in concrete on the floor. The cable was used in permanent buildings with a concrete floor and in 12 × 12-foot brooder houses with wooden floors.

Insulating board was placed over the wooden floors and three-fourths of an inch of concrete was poured over this with the heating cable in it spaced about 8 inches from center to center. With concrete floors the cable is laid when the concrete is still soft and is about a half inch below the surface of the floor. Floor heat was supplemented with electric hovers or infra-red heat lamps at the start of the brooding period.

As with any radiant heating operation, very little litter is placed on the floor, in this case not more

than one-fourth inch. The few farms using soil heating cable in Ohio report that it was satisfactory this past winter. One advantage of soil heating cable is that it can be used in small portable buildings without the expense of a heater.

The possible objections to cable might be: (1) The danger of power interruption; (2) some question as to whether cable alone would supply adequate heat in very cold weather; (3) high cost of operation.

In conclusion, let me summarize —most of the men interviewed were quick to point out the savings in litter with radiant heat. One operator who replaced an old brooder house with a capacity for 8,000 chicks with a new radiant heat plant expressed it, "$5 worth of litter is used now against $100 worth of litter in the old brooder house."

Most operators feel that there is a saving in fuel cost when radiant heat is used. One operator says he saved at least 15 percent. This, of course, is a difficult thing to get figures on.

There is no question but what there is a saving in labor. It is much easier to work in a radiant heated pen. Large numbers of chicks can be run in one flock. Crowding of chicks is eliminated.

Radiant heating as it is now used is best adapted to large brooder houses that are in operation the year around.

Don't Store Flowers and Fruit Together

Here's something to remember if you should get a corsage at Christmas or New Year's: flowers and fruit don't mix well in the refrigerator. And it's the flowers that come out second-best.

Apples, pears, bananas, even potatoes, give off minute quantities of ethylene gas, which, though harmless to man, shortens the life of flowers.

In fact, nurserymen who want to defoliate rose bushes before storing them in the fall, simply place a bushel of apples in a tight room with the rose bushes. That does the trick in a hurry.

A good way to keep gardenias, roses, camellias, or other flowers in a refrigerator, is to place them in an ice box dish, cover them completely with moist cotton, and keep the dish covered.

—Farm Journal

Teaming Up for Increased Production

Condensed from Fertilizer Review

M. V. Bailey

For many years fertilizers have been recognized as among the principal aids of the farmer in increasing his crop yields. The substantial benefits from their use are familiar to virtually everyone identified with agriculture. For a shorter time and in a more limited way, weed control by chemicals has been assuming a growing importance in farming practices. The phenomenal results secured in recent days with 2,4-D and other products have helped to persuade many people of the important role such chemicals can play in good farming.

Only for a brief time, however, have agricultural scientists surveyed the potentialities for promoting maximum yields and more efficient production through putting both fertilizers and weed control mixtures to work on the same crop. Early results of research appear to serve notice on the Nation that a new era in farming may be at hand—with an outlook that will be bright not only for production, but for greater profits per acre, for large savings in labor expended and for improved soil conservation.

However, a word of caution should be given. As in the initial stages of all research there is little consistency in the results. Some are favorable; many are not. But the promise of ultimate success is definitely in the cards.

One clue to the outlook is provided by the astonishing results obtained by following these two practices—fertilization and weed control—on experimental potato plots at Cornell University. Whereas the average potato yield per acre in the United States in 1948 was 212.4 bushels, the workers at Cornell found that they were able to grow 800 bushels, almost four times the volume. The implications of these results are obvious, not only for potato production but also for the production of other crops in the future.

So far little reliable information on weed control has been assembled that is national in scope. Experimentation at various points is moving ahead rapidly, however, and alert college and experiment station workers have united with commercial interests in the work of four weed conferences devoted to revising and assembling data. These conferences have been held

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in the North Central States, in the Northeastern States, in the South and on the west coast. In the assembly of vital facts in the growing field of weed control, consideration must inevitably be given to the joint use of "weedicides" and fertilizers. Then the prospects as they affect the agricultural economy as a whole may be more clearly examined.

The evidence already on hand is causing agriculturists to open their eyes even wider than before. Workers at Cornell admit that the idea of weed control in the field of potatoes is extremely new and that their work is still in the experimental stage. But at the same time they state that the subject "is perhaps the liveliest topic in potato production today. The potentialities of this phase of potato growing are tremendous and it has promise of being the biggest labor saver since mechanized potato growing arrived."

This is a startling statement, but its basis is a strong one. Farmers generally spend much time and money in their efforts to control weeds by conventional cultivating practices but the toll in yields remains heavy because many roots are injured or destroyed. Also, the yields are not as large as they might be for another reason. Cultivators require considerable room for their operation with the consequence that rows must be planted 32 to 36 inches apart. In Cornell's experiments, however, the use of weed control mixtures made it possible to space plants only 11×10 inches apart over the entire area except for the space required for the passage of sprayer wheels at each 30 to 35 feet. By such close spacing the number of plants per acre was tripled. But there's even more to the story. If planes or helicopters had been used in the applicaton of insecticides and fungicides even closer spacing could have been practiced.

On the heels of such revolutionary changes in planting, much attention would have to be given to fertilizers. More plant nutrients are required for the proper growth of closely planted crops. The rate of potato fertilization at Cornell under the new weed control method has run about 5000 pounds per acre while the average used on this crop in the United States in 1946 was 780 pounds per acre.

Weed control experiments with corn, grown in light soil, shed additional light on the prospects. In 1947 and 1948 the New Jersey Experiment Station demonstrated the possibility of dealing with weeds so effectively that the customary first and second cultivations of corn were unnecessary, and the work was all done even before the young shoots broke through the soil! When cyanamid treatments were applied and when 800 pounds per acre of a 5-10-5

fertilizer were also used, it was found that weed growth declined significantly while the ultimate corn yields were more than double those on the untreated plot.

A widely publicized and successful experience in controlling weeds in a Kentucky cornfield stimulated much research that is still going on. A large acreage of bottom-land corn was reported as being saved by 2,4-D sprays in the wet June of 1947, the application killing the prolific weeds which were as large as or larger than the corn plants themselves. On the basis of these results it appeared—for a time—that corn growers' weed problems all over the Nation might be solved, but in 1948 when spray applications were made with the same material on weeds smaller than the corn, there was much damage to the crop. Some research workers believe that this was due to the fact that more of the spray got on the corn when it was much larger than the weeds, with disastrous results following.

From experiments in other States it appears that progress on weed control with corn, America's largest crop, is making headway but much remains to be done. Results given out by the North Carolina Experiment Station are typical. In some cases pre-emergence applications of 2,4-D on early weeds gave satisfactory results; but in some tests almost complete failure was encountered. The over-all results served to remind agricultural scientists that no single solution to the problem of conquering weeds in corn has yet been found, and it is likely that no single solution will be discovered, but rather that, in each case, weed species, corn varieties, soil types, fertilizer treatments and other factors must first be given careful scrutiny.

In some tests it has been found that fertilizers alone not only increase yields but also effectively control weed growth. For instance, urea and cyanamid accomplish both when used on tobacco fields; so does cyanamid when used on asparagus. For many years mixtures of potash salts and cyanamid have been used with the same effects on small grains in Europe.

But such procedures have been known to lead, on occasion, to many complex problems only a few of which have been solved. Only last year, for instance, late side dressings of anhydrous ammonia on cotton in the Mississippi Delta produced such heavy weed growth in some fields that the use of mechanical pickers was found impossible. Such situations merit the urgent attention of those interested in improving farming efficiency.

Agricultural scientists, eager to promote the efficiency of the farmer and to shorten his hours of labor, have devoted careful

attention to the development of preparations containing both fertilizer and weed control mixtures. Such preparations have been reported by some authorities as leading to highly successful results but the instances are few and far between. Nevertheless research workers admit that such dual-purpose preparations, once made practical for use on a universal scale, would revolutionize our farm economy.

It is apparent, however, that the day may be close at hand when in many cases both fertilizers and weed control mixtures can be used effectively on many of our crops.

How To Repair Concrete

Condensed from Montana Farmer-Stockman

W. F. Schaphorst

EVERY ONCE IN a while the problem of repairing concrete floors comes up. The question is asked, "What can be done with a bad crack that leaks water? How can a repair be made that will be both substantial and waterproof?"

Unless there is considerable vibration on the floor, it is a simple matter to waterproof the floor by first cutting out the crack into a V-shaped groove to a depth of at least 2 inches. Sweep water over the newly cut concrete removing all loose particles of cement and sand.

Prepare a stiff and waterproof mortar by mixing 1 part Portland cement and 2 parts clean, sharp sand, and wet down with a solution of 1 part liquid waterproofing and 8 parts of water.

Immediately before filling the grooves with this new mortar, brush over the clean, damp surfaces a slush or bonding coat made by stirring into a solution of 1 part liquid waterproofing and 3 parts water enough Portland cement to form a thick, creamy, cold water paint. While this cement wash is still damp, apply the new mortar and trowel it to a smooth finish.

In a similar way the ruts and holes in a concrete floor can be cut out to a depth of 1½" below the finished floor and new patches applied, which will adhere to the underlying concrete, be waterproof, hard, and dustproof. These patches harden over night.

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John Wiley & Sons, Inc. — 280 pages — $3.25

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

"It has been nobly said that husbandry is the mother and nurse of the other arts. For when husbandry flourishes, all the other arts are in good fettle; but whenever the land is compelled to lie waste, the other arts of landsmen and mariners alike well-nigh perish."

—Xenophon (4th Century B.C.)
"Oeconomicus"